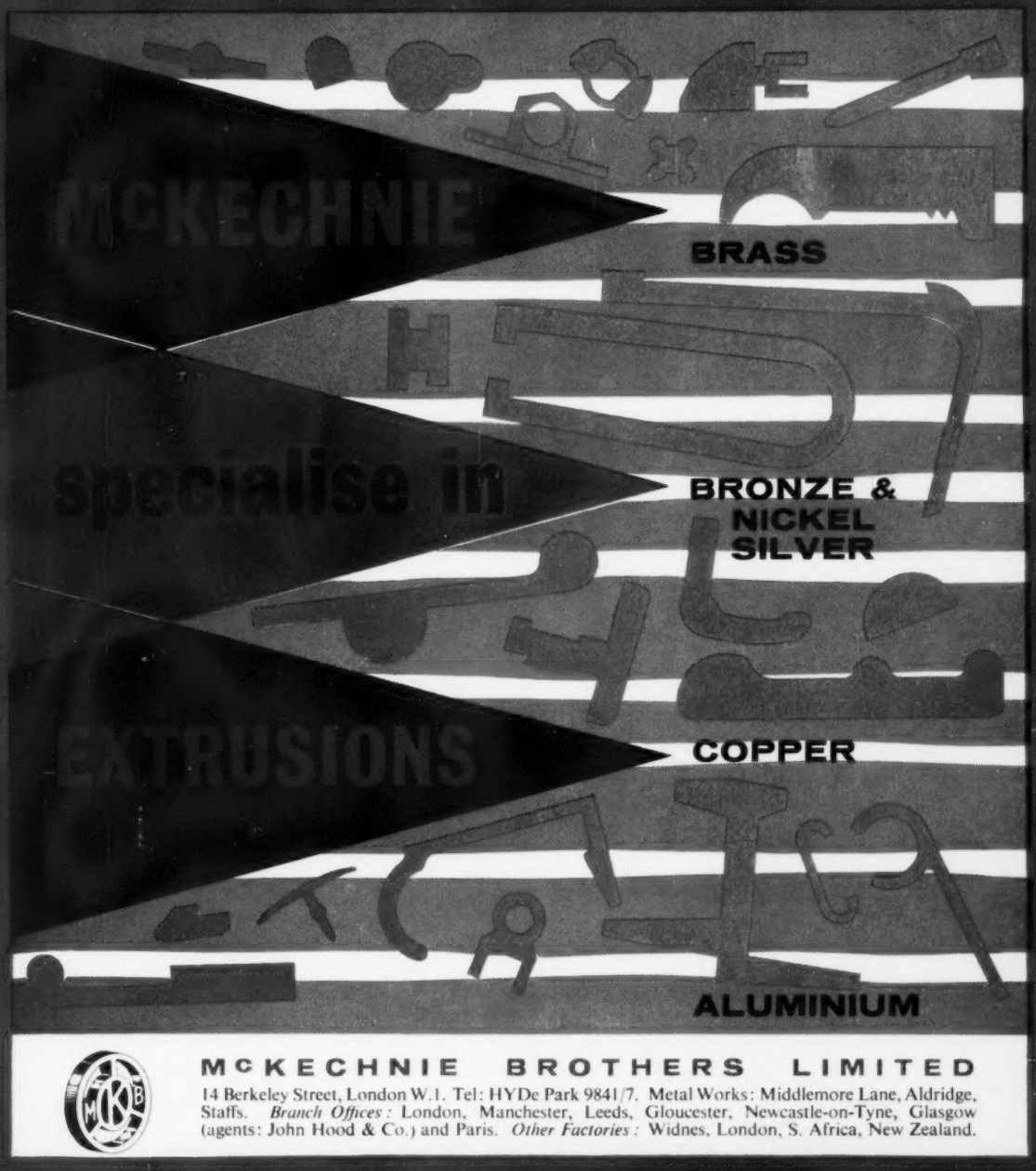
27 OCTOBER 1961

METAL INDUSTRY

THE JOURNAL OF NON-FERROUS METALS



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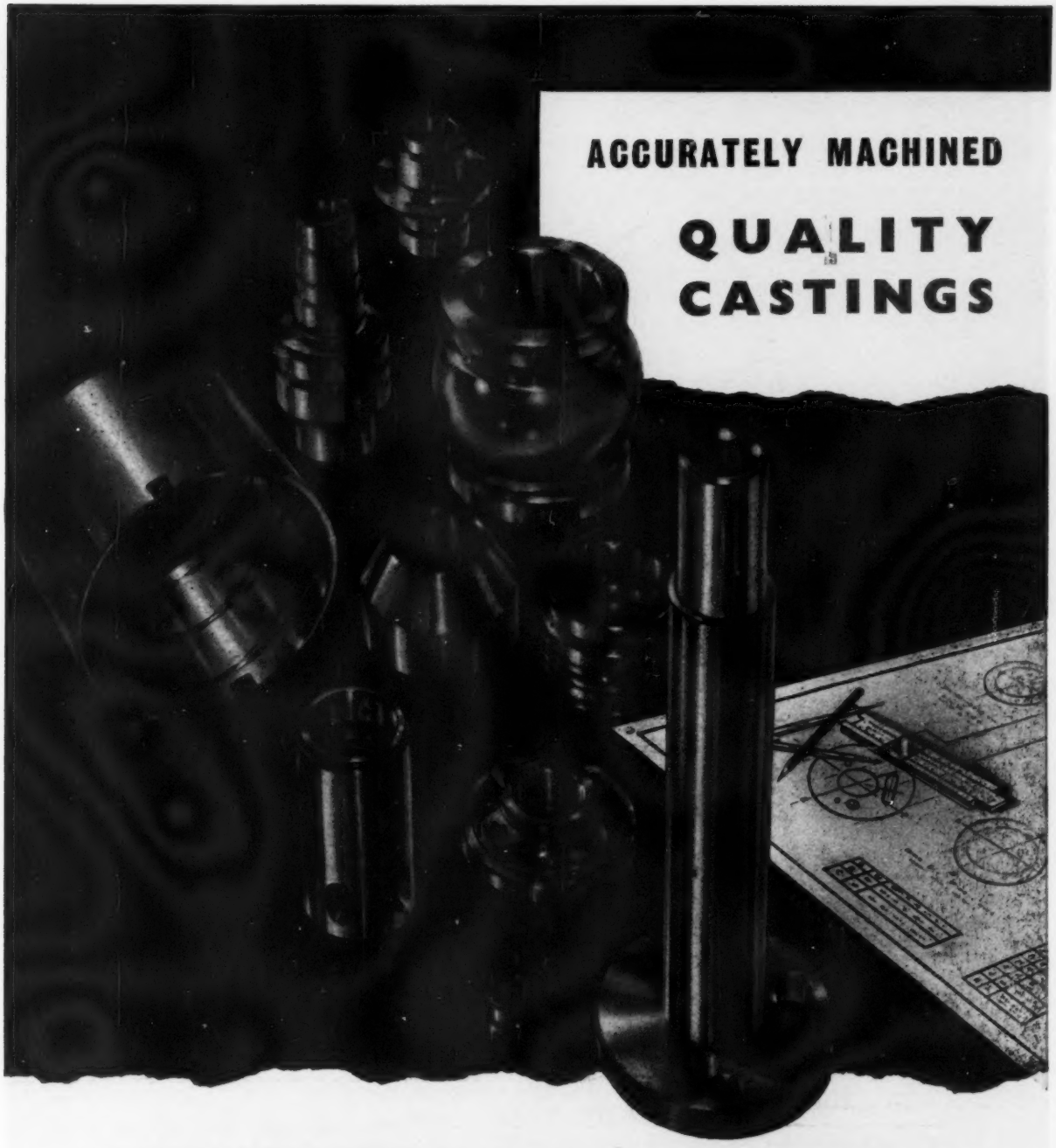

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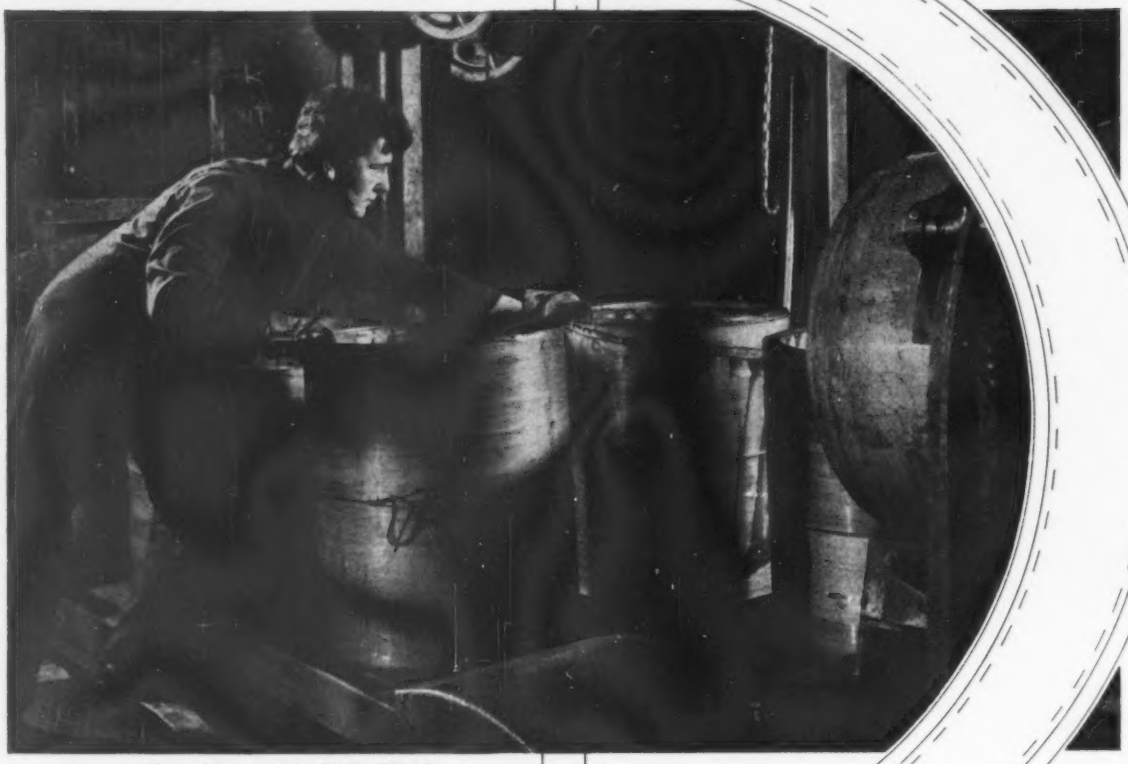

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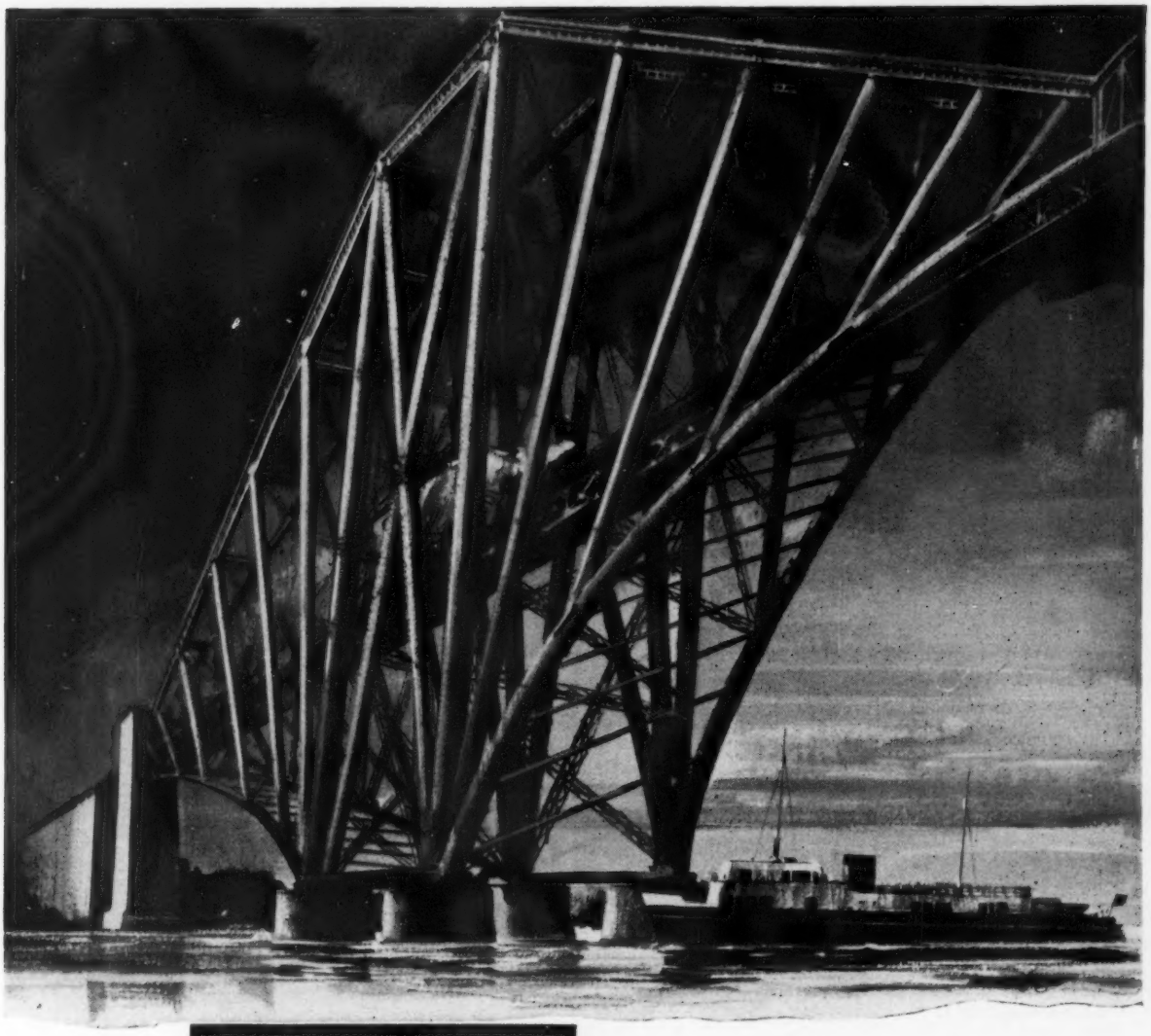

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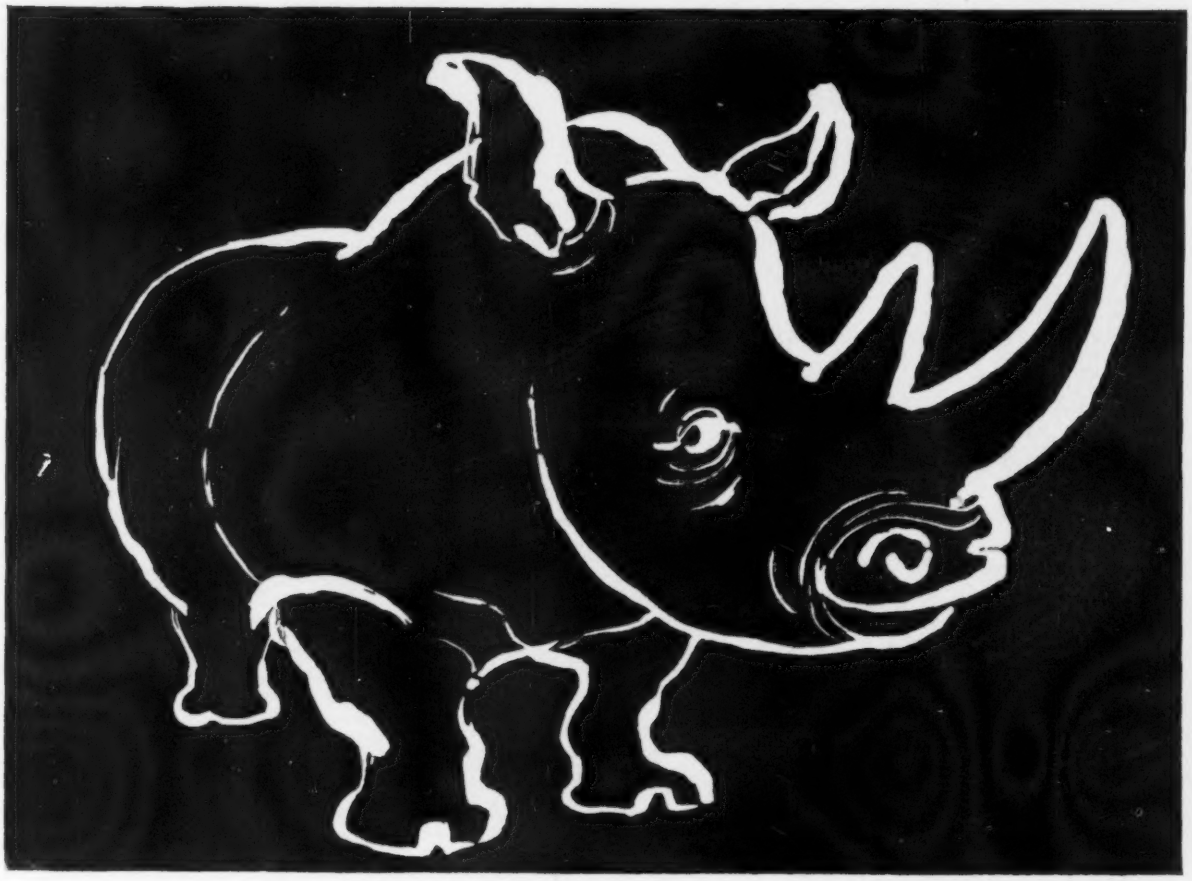

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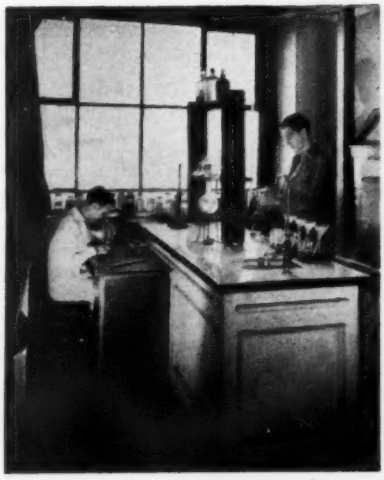

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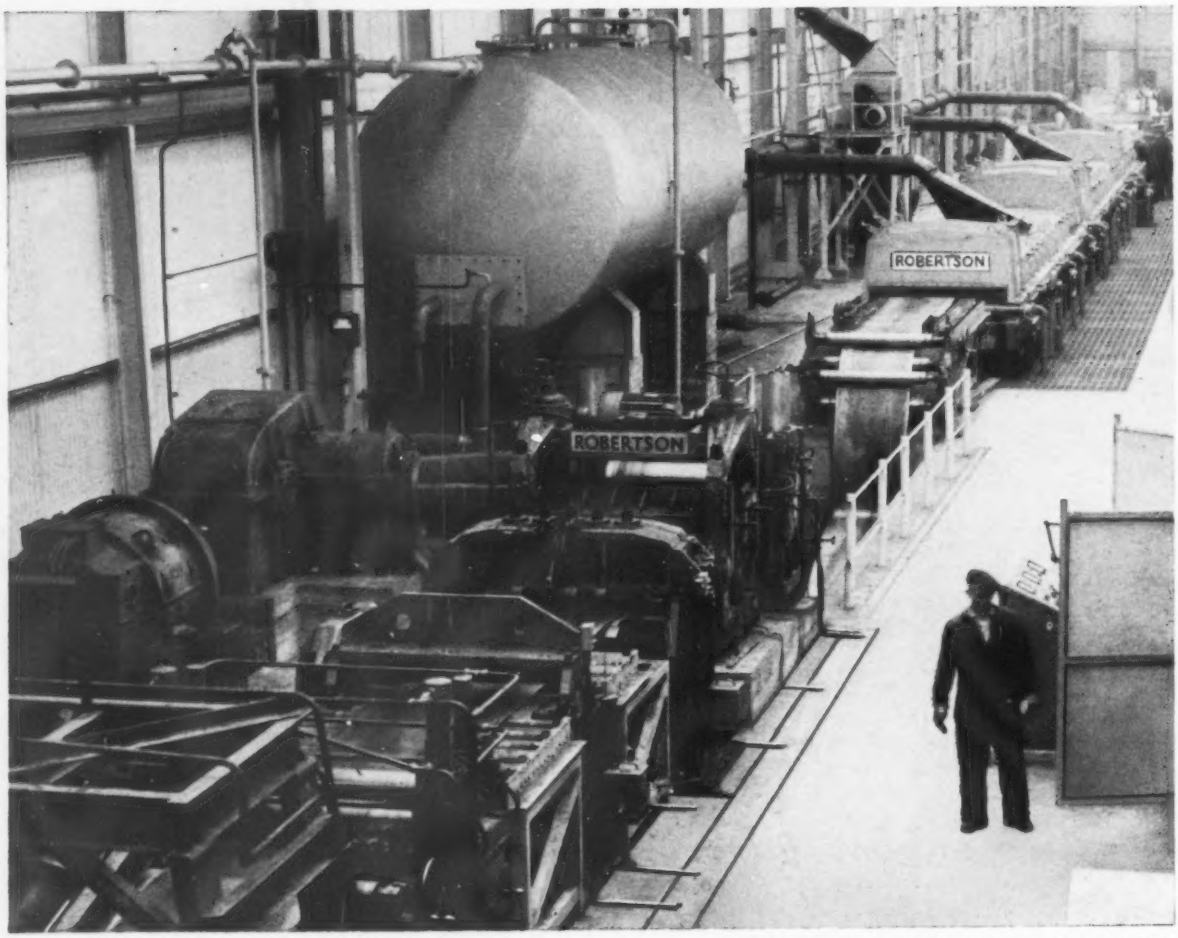

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27 October 1961 Volume 99 Number 17

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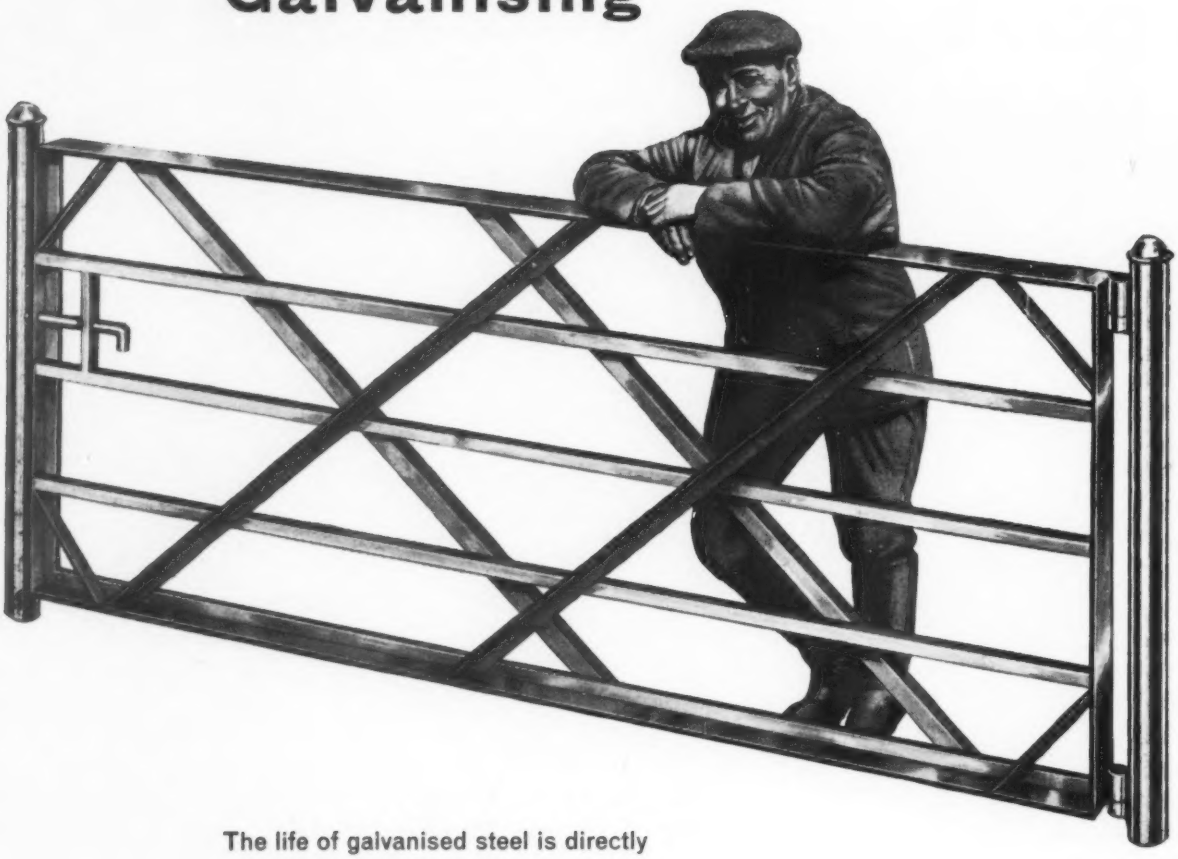

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METAL INDUSTRY

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VOLUME 99

NUMBER 17

A Decision Deferred

THERE will be a certain amount of disappointment in some quarters that the long-postponed meeting of the International Tin Council, held last week, should have ended inconclusively. The proposal of the producing countries to raise the floor price for tin under the international agreement to £800 per ton, and the ceiling price to £1,000, was defeated. A simple distributed majority was not obtained. The official communique issued after the meeting said that the proposal was put to a vote in the absence of alternative proposals by consuming countries. The council agreed that the present floor and ceiling prices were not appropriate for the attainment of the objectiveness of the agreement, but a majority of consuming countries considered that this was not the time to modify the price range. The result of the voting was as follows: producing countries, 1,000 votes in favour and none against; consuming countries, 121 votes in favour, 879 against. The whole question is to be considered further at the next meeting of the I.T.C., due to be held in London on February 14 next year. The current floor price of tin is £730 and the ceiling price £880.

It is said that the negative result of this meeting did not come as any great surprise to most London tin dealers. It had been considered that there was little the council could do, in view of the buffer stocks position of large reserves of cash and no tin, as well as the small likelihood of getting any stocks of tin now that the United States Government has adjourned until January. The communique in some respects is considered rather "bullish" as far as the long term view is concerned, in that it points to the fact that no stocks of tin are likely to become available, presumably from U.S. sources, in the near future, and it is thought that values will gradually work higher as the strong statistical position of the metal reasserts itself. Apparently, the council prefers to wait for the United States Congress to re-assemble and possibly do something about releasing tin from the national stockpile, before meeting again. No mention was made in the communique about the progress, if any, of the council's approach to the United States Government for releases from the strategic stockpile to ease the world tin shortage. It may be, however, that the council has decided, perhaps wisely, to wait for the reassembling of the U.S. Congress in January, when it may be that the U.S. Administration may be allowed to release some substantial tonnage to help the situation. Following that, the consumer countries may well find themselves able to decide on an acceptable new price range.

Tin share dealers on the Malayan Stock Exchange were reported to be very disappointed with the Council's communique, and at the time of writing the L.M.E. quotation hovers around the £940 mark, with stocks still declining. Last week's further disposal of G.S.A. metal in the U.S.A. is not expected to be a market factor, as the tin content is thought to be negligible.

Electric Heating For Non-Ferrous Metals

By J. T. Sharples, B.Sc. Tech., A.M.I.E.E.

(*Continued from* METAL INDUSTRY, 20 *October* 1961)

ELECTRIC melting of soft metals is carried out on a large scale in factory and workshop in pots and baths heated by externally applied heaters or by immersion heaters. In both cases, thermal insulation leads to high efficiencies, but the immersion heater obviously provides maximum efficiency since all the energy supplied and paid for is turned to heat within the metal itself. Immersion heaters, comprising groups of metal sheathed heating elements, sometimes cast into a block of tough cast iron, can successfully cope with the heat and corrosion hazards of a range of melting processes such as those connected with lead, tin, Babbit, solders, type metal, etc., and should preferably be used wherever conditions are suitable. Extensive use of immersion heaters is made in newspaper foundries for the melting of type metal, and Fig. 9 shows such immersion heaters in use at Odhams Press Ltd.

In the light metals field, the improvements made in heat-resisting materials, both for heating and insulation, and in crucibles, have resulted in new resistance-heated crucible furnaces of the bale-out and automatic ladling types for die-casting, which, being so readily adapted to fully automatic control, present an attractive proposition to foundries. They provide the improvement in working conditions to which growing importance is attached, and in addition the cost of melting can often be reduced by arranging for melting to take place during the night "off-peak" period, the metal being ready for casting at the start of the working day.

Hedin Ltd. have recently introduced a new design of aluminium holding furnace in three sizes of 500, 1,000 and 1,500 lb. capacity, which is claimed to be a considerable improvement over older types. Heating is effected by tape elements located in the roof which, for longer life, are supplied at low voltage and which can be replaced, if necessary, very simply without affecting bale-out (Fig. 10).

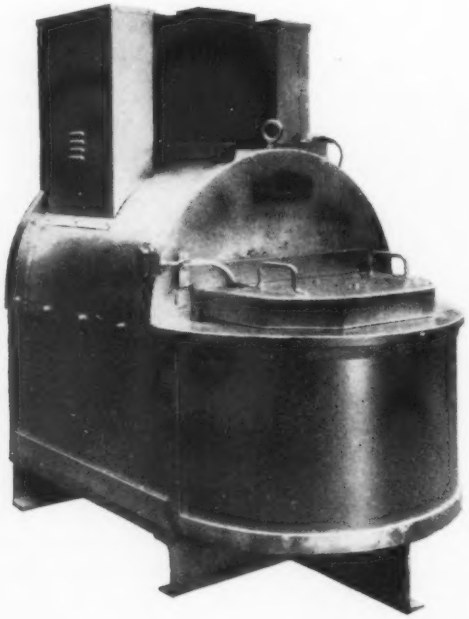
The low-voltage transformer is fitted on top of the furnace and the space requirements of the 500 lb. size are 6 ft × 3 ft. Standing losses are 4½ kW with the furnace idle and covered, and 7½ kW with the bale-out end open as it would be for normal working.

A dry hearth aluminium melting furnace with companion holding furnace capable of melting 500 lb/hr. for casting and for aluminium scrap recovery has been produced by Efco. Scrap is preheated in a charging hopper and is then melted in a vertical muffle, heated externally by silicon carbide elements, mounted on a sloping, silicon carbide hearth which directs the molten metal through a covered trough to the holding furnace for precise temperature maintenance. Melting and holding take place in a dry nitrogen atmosphere to prevent oxidation, any oxide in the scrap being raked out through a plug door at the rear which can also be used for inserting ingots. The melting furnace is rated at 100 kW, the holding furnace, of 1,500 lb. capacity, at 20 kW (Fig. 11).

Fully automatic die-casting is possible by the use of the holding furnace made by Foundry and Metallurgical Equipment Co. Ltd. and incorporating the American Lindberg Autoladle which dispenses accurate amounts of metal at regular intervals to a die-casting

Below: Fig. 9—Barlow-Whitney immersion heaters in a type-metal bath

Right: Fig. 10—Low-voltage resistance heated aluminium holding furnace by Hedin Ltd.



machine via a heated launder. The furnace, of 2,000 lb. capacity, with separate charging and ladling wells, is again heated from the roof, this time by silicon carbide elements. The pneumatically-operated Autoladle submerged in the ladling well can discharge aluminium from below the surface at rates of up to 15 lb. at one minute intervals. The first installation of this model was recently carried out at Aeroplane and Motor Aluminium Castings Ltd. (Fig. 12). Larger models can deliver at rates of up to 60 lb., and holding capacities can be down to 300 lb.

Continuous casting techniques are increasingly employed to produce high quality rods and tubes, and a development with which Morganite Electroheat Co. have recently been concerned provides thermostatically - controlled electric heating of the refractory chamber in which the tundish and the top end of the water-cooled graphite die are housed. Heating is by 12 of their silicon carbide elements in three vertical layers, surrounding the tundish, and loadings vary from 10 kW for 20 lb. tundish to about 30 kW for 400 lb. The average load in use for the 20 lb. tundish is, however, only around 3 kW. A nitrogen atmosphere, when needed, presents no difficulty. Apart from the advantage of close temperature control and the absence of local overheating, leading to longer pot and die life, there is a complete freedom from sulphur or hydrogen pick-up, and the trouble known as "tin-sweat". Two plants have been operating recently on high-tin bronzes with complete satisfaction, with a third building, and the experience is that these advantages of electric heating are obtained without increase of fuel cost over oil firing.

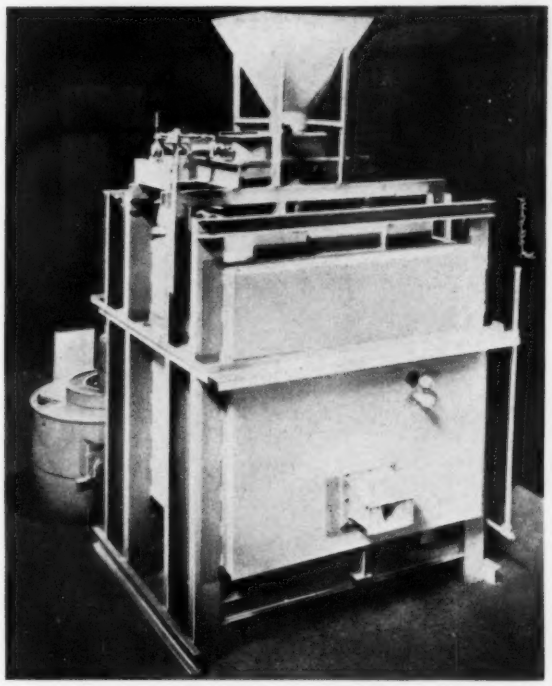


Fig. 11—An Efco dry hearth aluminium melting furnace with companion holding furnace

Direct Resistance Heating

In direct resistance heating the electric current is fed directly into the charge itself, and heat is generated within the charge proportionally to the electrical resistance of the charge and the square of the current flowing through it. The same effect is experienced in induction heating, but here the current is electromagnetically induced in the charge and not fed directly from a source of supply.

Direct resistance heating has been used effectively for years in, for example, soft and hard soldering operations, heating of some chemical pipelines, and so on, but a Paper presented at the Electroheat Congress in Essen last year and reprinted in "Elektrowarme" in January this year shows that considerable development work has been going on in Germany to use this method for the through heating of billets prior to rolling. Although the Paper is concerned with the heating of steel billets, the method can clearly be used wherever the billet material has an electrical resistance of a similar order, for example nickel-chromium alloys, or the billet dimensions and the required temperature are such as to demand similar magnitudes of current and applied voltage. Hence, no apology is necessary for the introduction here of a summary of the salient factors involved in this billet-heating technique.

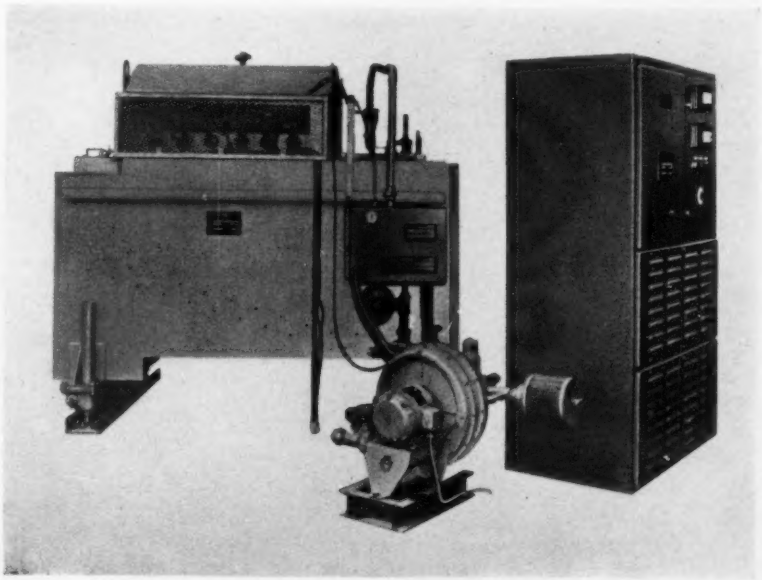
The advantages of the method, apart from the normal advantages of cleanliness, etc., can be summarized as follows:

(1) Very rapid heating (from 30 to 120 sec. for normal steel billets to rolling temperature) avoids scaling or metallurgical changes of metal structure.

(2) Internal heat generation ensures high thermal efficiency (over 80 per cent in some existing plants), uniform temperature distribution and low heating cost.

(3) The equipment is ready for immediate use and no electricity is consumed during stand-by periods. Heating can easily be dovetailed with

Fig. 12—Automatic aluminium ladling furnace by Foundry and Metallurgical Equipment Co. Ltd.



the mill programme, and be made fully automatic.

(4) A minimum of floor space is required, maintenance costs are low and replaceable parts, such as the contact pieces, easily manufactured.

Many of these advantages are, of course, common to the induction heating of billets, although direct resistance heating produces a more uniform temperature distribution across the billet in a very fast heating cycle than induction heating, where some time has to be allowed for heat to be conducted to the centre from the outer layer in which it is generated. There is, however, a limit to the size of billet for which direct resistance heating is more efficient than induction heating, this limit depending upon the characteristics of the billet material. For steel, the efficiencies of the two methods are stated to be about equal for billets about 25 in. long and 5 in. across. For longer, thinner billets, resistance heating is the more efficient, but for shorter, thicker billets induction heating takes over.

In Germany, steel billet installations have been constructed up to 2,000 kW, but it is visualized that equipments will increase in size up to 5,000 kW or 6,000 kW and arrangements are being discussed for converting the process from single phase to three phase operation to provide a more acceptable load to the electricity undertaking. The main problem with direct resistance heating is that of providing good contact arrangements to feed the heavy current to the billet. Considerable development work has been done on this problem and two arrangements have emerged offering practical solutions to the problem. One effects contact on the end faces only and is the simpler arrangement but is more troublesome on long, thin billets; the other reinforces end contact by contact clamps on the sides. It is said that adjustment of the clamping pressure can overcome the cooling effect of the contacts, hitherto troublesome. Direct resistance heating is in use in this country, for example on upsetting machines, but it would appear that the method merits further development.

Arc Furnaces

The arc furnace has a relatively narrow field of use in the non-ferrous field, and there has been no marked development since the advent of the rocking-arc furnace and its use for melting certain copper-rich alloys, in particular lead-bearing alloys. It is especially applicable to the making up of high melting-point alloys, and an example is to be found in a recent installation of a 250 kVA direct arc furnace for the manufacture of beryllium copper. In this case, it is necessary to heat the copper charge to about 3,000°C. before it will readily absorb the beryllium, and the arc furnace provides the answer to this problem.

(To be continued)

Reader's Digest

INDUSTRIAL FURNACES

"Industrial Furnaces." Vol. 1, Fifth Edition. *By W. Trinks and Matthew Mawhinney. Published by John Wiley and Sons, Gordon House, Greencoat Place, London, S.W.*1, *and New York. Pp.* 486 + *x. Price* 136*s.*

BOTH old and young metallurgists will be pleased that these two authors have combined their efforts to produce this classic on industrial furnaces. The older metallurgists will well remember "Industrial Furnaces", by W. Trinks, making its appearance about 1924, and "Practical Industrial Furnace Design", by M. H. Mawhinney, about 1928. Since then, fundamental changes have taken place in all conceptions of furnace design, furnace capacity, furnace equipment, automation and atmospheric control. Furthermore, there is today a more logical understanding of the fundamentals of combustion, heat transfer and draught than ever before.

Fuel costs have increased so much in recent years that fuel conservation has become of primary importance. Heat transfer and fuel economy are now to a large extent governed and controlled by empirical methods based upon simplified physical laws, and few have done more to further such knowledge than the joint authors.

For many years heat-treatment was confined mainly to ferrous alloys; today, however, a great many non-ferrous alloys are available to engineers which require specialized heat-treatment. The effect of these improvements in metallurgy demanded better furnaces—furnaces which would give a better distribution of heat. To prevent excessive oxidation, a control of the furnace atmosphere became just as important; thus, the study of the regulation of furnace pressure and fuel-air ratio introduced every source of mechanical and electrical instrument in a confusing variety to furnacemen.

The authors have found it necessary to devote no less than three chapters to heating capacity, which introduces many complications in the study of furnace economy and efficiency, for, as furnaces become larger and the amount of metal to be heated increases, the differences between the cooler and hotter parts of the furnace are more manifest. Thus, the amount of metal that can be heated in unit-time to a determined temperature without the metal becoming overheated in the hotter parts of the furnace brings its complications in the study of heat transfer and furnace efficiency, involving many considerations of emissivity, type and thickness of the stock, insulation and refractories, fuel, combustion efficiency, velocity of gases, etc., and also whether the furnace is of the batch or continuous type.

A chapter which might well be considered by many industrialists in the United Kingdom is the one which deals with the utilization of flue gases and waste heat. One sees far too much heat going up the stack which could well be used for preheating cold stock or combustion air. The fifty pages given to the "Utilization of Heat in Flue Gases" fully justify their inclusion.

Naturally, materials used for furnace construction, furnace foundations, strength of furnace roofs, hearths, etc., must find a place in such a book. Nevertheless, the reader would do well to study those parts of the book dealing with expansion joints, for such are too often neglected by some furnace builders, and especially by builders of reconstructed furnaces, which accounts for the distortion and buckling tendencies we too often notice in furnaces. One also wonders why so many furnace doors are neglected by furnacemen. If furnace gas flow and heat transfer have to be efficient, and furnace economy high, inefficiently sealed doors cause great heat loss and excessive fuel consumption.

Yes, this book is a classic on the subject of furnaces. **D. Ll.**

High Purity Metals

IN recent years, the rapid advance of technical developments in many fields has brought demands for a wider variety of high purity metals and a greater diversity of physical forms. Johnson, Matthey and Co. Ltd. have investigated and perfected techniques for producing an extensive range of high purity metals and for fabricating many of them into a variety of forms.

In a series of data sheets recently published, information is given on 38 metals, including noble, rare earth and certain base and rarer metals. The general properties of each element are tabulated and details are given of the forms of current production. In most cases, the metals are available in more than one grade, the metallic impurity contents being expressed in parts per million.

These data sheets are available on request to the company's head office at 73-83 Hatton Garden, London, E.C.1.

Investment Casting

REVIEW OF PROCEEDINGS AT EUROPEAN INVESTMENT CASTERS ASSOCIATION CONGRESS IN FLORENCE

As usual, this year's Congress of the European Investment Casters Association, held in Florence, was quite an international gathering with over 80 participants from nine European countries, as well as from Canada and the U.S.A. Britain was well represented by 20 delegates headed by R. W. Danielsen (Deritend Precision Castings Ltd.), chairman, British Investment Casters Technical Association.

Investment precision casting, based on the "Lost Wax" process, was introduced into the U.K. in 1942, and into continental Europe after 1945. In this short period of time, investment casting has become a well-established production method. This rapid growth has been characterized by a close technical collaboration on an international plane, which has been greatly facilitated by the formation some years ago of the European Investment Casters Association.

The town of Florence provided an ideal setting for the meetings, which were held in the rooms of the Associazione degli Industriali della Provincia di Firenze.

The official opening of the conference was preceded by a reception at the Hotel Villa Medici, and this afforded an opportunity to renew old acquaintances and form new ones.

The conference proper was opened by the association chairman, H. J. Meerkamp van Embden (Philips, Eindhoven), who introduced Prof. Bearzi. Prof. Bearzi welcomed the participants and their ladies to Florence, and then delivered a most interesting address on bronze art founding.

Technical Proceedings

Over the three-day period of the conference, some 17 Papers were given and discussed.

A. Dunlop (Jessop-Saville Ltd., Sheffield) presented the first Paper, which dealt with the application of vacuum techniques to investment casting. This covered the manufacture of vacuum processed master melts, melting and casting equipment and the properties of a series of vacuum cast high temperature alloys compared with the most highly developed wrought high temperature alloys. The point was made that the use of vacuum techniques has resulted in the development of super alloys and their application, for the first time in Britain, in cast rotating blades for production of aero gas turbine engines.

R. Waindle (Wai-met, Detroit) reported on the healthy state of the investment casting industry in the U.S.A. The value of such castings produced in 1960 was $87,000,000, distributed as follows:

	per cent	$
Turbine blades	44	38,000,000
Turbine wheels	7	5,500,000
Aircraft	17	15,000,000
Castings for U.S. Government work	11	10,000,000
Commercial castings	21	18,500,000

Waindle's Paper on Foundry Controls, originally given to B.I.C.T.A. last May was also presented.

K. Keiper (Pfaff, Kaiserslautern), S. Peller (Spinnereimaschinenbau, Ingolstadt) and S. Gunde Ohlin (Kanthal, Halstahammer) each presented Papers dealing with different aspects of surface decarburization when investment casting carbon steels. The first Paper stated the nature of the problem and the degree of decarburization encountered when making sewing machine parts in 0·5 per cent carbon steel. The second Paper outlined various precautions during manufacture to reduce decarbonization, e.g. the addition of trichloroethylene to the mould prior to casting and reducing the cooling time of the casting by control of mould and casting temperatures. Ohlin described the adaptation of a butane/propane gas generator, of the type used for case hardening, to recarburize the surface of high carbon steel investment castings, when high surface hardness is required.

With the aid of colour slides, M. Marinier (Renault, Billancourt) described the lost wax foundry of Renault in detail. This foundry is laid out to mass produce castings requiring approximately 1,000 kg. of steel and 600 moulds/day. The moulds shown were of the solid type, no reference being made to the more recently developed ceramic shells which are becoming increasingly popular.

Development of investment casting in the U.S. was discussed by R. W. Tindula (Washington) in the light of patent applications. The services provided by the U.S. Office of Technical Services were indicated; these include bi-monthly publication of U.S. Government Reports and English translations of Russian and other technical publications.

The problem of non-fill or misruns in investment casting was dealt with by H. Rosenthal (Frankford Arsenal, Philadelphia). Methods of testing and controlling fluidity were discussed. Effects of vibration during casting and mould permeability were also considered.

R. M. Cook (International Nickel Co. (Mond) Ltd., London), presented a detailed report on the properties of vacuum cast turbine discs in Nimocast 713 V. This showed that integrally-bladed turbine rotors of high quality may be vacuum cast. Some of the critical foundry factors involved were demonstrated.

In contrast to the earlier Papers, which were mainly of a metallurgical nature, the Paper by P. Buysman and H. J. Meerkamp van Embden (Philips, Eindhoven) dealt in a theoretical manner with factors affecting drying of dipcoat.

L. S. Taylor (G. L. Willan, Sheffield) described in detail H.F. vacuum melting and casting equipment developed to deal with 1,000 investment moulds per week. Taylor favours the use of semi-continuous melting equipment using one H.F. generator in conjunction with two furnace units, each unit having its own vacuum system. While one furnace is melting down, the other unit is being unloaded and recharged.

J. Sprunk (Bohler, Düsseldorf) discussed a mathematical formula for the valuation of investment castings. While the factors which influence productive capacity are many, the most important are the number of castings and the weight. The formula can only be applied in the production of a large quantity of similar items.

In a short communication, H. Moeschlin (Propharma, Goteborg) described a small plant set up for the manufacture of surgical implant castings in a cobalt-base alloy.

R. Roques and M. Cameo (Microfusion, Paris) discussed the mechanical properties of investment cast 0·35 per cent carbon, 1 per cent chromium, 0·25 per cent molybdenum steel. Such factors as casting temperature, mould temperature and rate of cooling after casting were considered. Properties of

castings made in solid investment moulds were compared with those from ceramic shell moulds, the faster cooling rates possible when using shell moulds resulting in improved mechanical properties.

In the final session of the conference, two further Papers were presented from the U.S.A. H. Cadieux (Casting Engineers, Chicago) described his plant for the production of commercial and industrial castings, and K. W. Thomson (K. W. Thomson Tool Co., Long Island) described in some detail the solution of a non-ferrous casting problem.

In a "case history", I. L. Gwynn (P. I. Castings, Altrincham) described the manufacture of steel spring components by investment casting.

The concluding item of the technical programme was the presentation by H. J. Marshall (Nicolas Herzmark, Paris) of colour slides and a film illustrating lost wax investment casting and the Shaw Process of investment casting.

Most of the companies represented showed one or more of their products, and the collection gave a most impressive display of the scope and versatility of investment casting. The diploma for the "best casting of the year" was won by Deutsche Edelstahlwerke with a collection of gas turbine rotor castings in heat-resisting alloys. The diploma for the "casting opening the widest scope for future use of investment castings" was won by J. Valenta, of Canada.

It was announced that an invitation had been received to hold the next conference in Stockholm, Sweden, May 1963 being suggested as an appropriate time.

Reporting on co-operative research work, A. Bouman (Werkspoor, Amsterdam) reviewed the results given in the last Congress proceedings on the influence of alloy elements and heat-treatment on the quality of cast steel as produced by investment casting. To guide him as to future work, Bouman invited participants to complete a questionnaire he had prepared, giving a list of possible projects. On receiving the returns, Bouman will prepare a programme.

The City of Florence has a tradition in bronze art casting extending from the days of Benvenuto Cellini. A fitting conclusion to the conference was a visit to Fonderia Marinelli to see this aspect of "lost wax" casting.

MEN and Metals

In connection with the formation of a new company (see page 348), the following appointments have been made to the board of G.E.C. (Engineering) Limited:—**Mr. R. N. Millar** (chairman and managing director), **Mr. T. H. Kelsey** (director and general manager, Witton works), **Dr. K. J. Wootton** (director and general manager, Erith works), **Mr. C. J. O. Garrard** (commercial), **Mr. E. Nicholson** (financial), **Dr. H. K. Cameron** (development), **Mr. G. M. F. Donnelly** (production), **Mr. W. D. Morton** (personnel and assistant general manager, Witton works), **Mr. J. E. Thomas** (secretary). Other appointments to the new company are **Mr. D. W. T. Angwin** as assistant general manager at Erith, and **Mr. J. C. Morris** as commercial manager, export projects.

Manager of roll sales of Armstrong Whitworth (Metal Industries) Limited, **Mr. T. A. Bird** has left on a round-the-world sales tour through five countries. He will return early in December after visiting rolling mills in the Rhodesias, South Africa, Australia, Mexico and Canada.

At a special meeting of the Council of the Industrial Welfare Society, **Mr. John Garnett** was appointed director of the Society. Mr. Garnett becomes the Society's third director in its 43 years' existence. He was previously with Imperial Chemical Industries Limited, where he was responsible for the communications section of the Central Labour Department.

News from the British Iron and Steel Federation is that **Mr. E. W. Senior** has been appointed director of the Federation. **Mr. J. B. Cowper** is to be the managing director of British Iron and Steel Corporation in addition to his present position as financial director of the Federation. Other appointments are as follows:—**Mr. J. Driscoll** to be assistant director (economics), **Mr. L. J. Gollop,** assistant director (statistics); **Mr. B. S. Keeling,** assistant director (training), and **Mr. A. H. Mortimer,** assistant director (commercial). **Mr. K. Donohue** is to be secretary of the Federation.

It is announced by Electronic Instruments Limited that **Mr. Kenneth Brockhouse Hogg** has been appointed general works manager of the company.

Director of Studies at the Royal Military Academy, Sandhurst, since 1948, **Mr. T. S. J. Anderson,** C.B.E., T.D., M.A., is to join the staff of Vickers Limited on January 1 next, in the newly-created appointment of Controller of Education and Training.

At the recent monthly meeting of the Governing Council of the British Engineers' Association, the following elections of officers for the ensuing year were made:—President, **Mr. E. N. Griffith,** C.I.B.A.E. (chairman of Rotary Hoes Limited); Vice-President, **Mr. K. M. Leach,** B.Sc., A.M.I.Mech.E. (director of Serck Limited and of Audco Limited), and hon. treasurer, **Mr. A. I. Baker,** C.B.E., M.A., J.P., M.I.Mech.E. (chairman of Baker Perkins Limited and Immediate Past-President of the Association).

Three new directors have been appointed to the board of Castrol Limited as follows: **Mr. Leonard Colkett, Mr. Kevin McCarthy** and **Mr. George Thornley.**

Joint managing director of Gummers Limited, of Rotherham, **Mr. Leonard W. Gummer** is shortly to retire. Mr. Gummer will retain his seat on the board of the company, and also that of Wright, Bindley and Gell Ltd., the parent company.

Joining Associated Electrical Industries in a consultative capacity, **Sir Eric Jones** was the former Director of Government Communications Headquarters at the Foreign Office.

Official appointments recently announced are as follows:—**Mr. J. E. Serby** to be deputy controller of Guided Weapons in the Ministry of Aviation; **Mr. R. E. Sainsbury** to be director-general of Guided Weapons and Electronics Production; **Mr. R. V. Whelpton** to be director of the Ministry of Aviation's Signals Research and Development Establishment at Christchurch.

With 34 years' uninterrupted service to the industrial side of the Castrol group's business, **Mr. C. W. Page** has been appointed sales manager of the Industrial Division of Castrol Industrial Limited.

Chemical Analysis

LATEST in the series published by the American Society for Testing Materials, the 1961 Book of ASTM Methods for Chemical Analysis of Metals is supplemented by many new testing procedures approved by Committee E-3 on Chemical Analysis of Metals.

Among the topics covered are: sampling methods, chemical analysis of ferrous and non-ferrous metals, analysis of metal powders, and spectrochemical and microchemical analysis methods. There are also data on standard samples of metals issued by the National Bureau of Standards.

This book is an integral part of the Book of ASTM Standards, although not assigned a part number, and is the only publication in which ASTM chemical analysis of metals methods are found in convenient form.

Copies of this book may be obtained from ASTM headquarters, 1916 Race Street, Philadelphia 3, Pa., at $11.00 each. To ASTM members, $8.80.

Chemical Deposition Of Platinum Metals

PROCESS FOR PLATING PLATINUM GROUP METALS ON PRINTED CIRCUITS

DEPENDING upon a chemical reaction between the basis metal and the plating solution, the deposition of platinum group metals by chemical displacement does not need an external impressed electric current. A process of this kind has now been developed by the International Nickel Co. (Mond) Ltd. and is being marketed by Engelhard Industries Inc. Slightly porous deposits are obtained from these solutions, enabling continuous deposition to take place, resulting in the build-up of relatively thick deposits. This effect is in contrast to more conventional replacement processes where quite thin coatings only are possible. Deposits may be sealed after plating so that a virtually non-porous deposit of useful thickness is finally obtained.

Operating instructions given below are particularly suitable for plating on to copper. If it is required to plate metals other than those specifically referred to, some modification of the procedure may be necessary. The procedure is particularly applicable to the plating of palladium and rhodium on to printed circuits, since it eliminates the need for electrical connections to isolated parts of the printed pattern.

As in all plating processes involving relatively thin deposits, the final finish of the plated parts will depend largely on the quality of the initial surface. Parts should, therefore, be polished to the required finish by buffing or other appropriate means. Two further advantages of a good initial finish are:

(i) The danger of detaching any small excrescences on the surface by attack during the plating operation is avoided. Such detachment may lead to discontinuity of deposits.

(ii) A good finish on the final deposit makes subsequent soldering more easy. This is particularly important when the basis metal is brass.

The recommended procedure is, briefly, as follows:

Polish the part to the required finish. Remove excessive amounts of grease, etc., by treatment with an organic solvent, e.g. carbon tetrachloride. Immediately prior to plating: Immerse in acetone for 1 min., immerse in a hot, dilute aqueous solution of any suitable detergent, then rinse well in distilled or demineralized water.

Plating

The stock solutions as supplied contain 50 gm/L. of the metal to be deposited and are diluted to a working concentration of 5 gm/L. as follows: Measure out 100 mL. of the stock solution; add 250 mL. of concentrated hydrochloric acid (32 per cent); dilute to 1 L. with distilled water.

All plating operations should be carried out without agitation. The cleaned parts prepared for plating should be immersed immediately in the appropriate platinum group metal solution under the conditions set out in Table I. If desired, however, the cleaned parts may be stored for several hours in distilled water without any adverse effect.

Sealing

After plating, the articles should be rinsed quickly by dipping in water (preferably distilled or demineralized) and treated by one of the following procedures:

(1) Immerse the parts for 5 min. in "Atomex" immersion gold plating solution at 90°-100°C. This is prepared by diluting the concentrate as supplied with 8 parts of water and adding 1 mL. of concentrated ammonium hydroxide solution per 100 mL. of solution. Ammonia addition should be repeated at 4-hourly intervals so long as the solution is at operating temperature. Parts should be rinsed thoroughly before drying.

(2) Immerse the parts for 5 min. in a solution of one part of concentrated ammonium hydroxide solution diluted with two parts of water. Rinse well in water and dry.

(3) Immerse the parts for approximately 15 min. in boiling distilled water. Remove and dry.

Of the above sealing procedures, the gold seal (1) is preferred when the component is to function as an electrical contact surface. The hot-water seal (3) gives a bright, white appearance to the deposit but slight tarnishing may occur over long periods, indicating a residual porosity which might be useful for holding lubricant in sliding contact applications. The ammonium hydroxide immersion treatment (2) gives a bright, white deposit of intermediate tarnish resistance.

Solution Maintenance

Plating solutions should be covered when not in use and any evaporation losses made up by adding distilled or demineralized water. The solutions are not affected by heat, and although no agitation should be used during the plating process, it is beneficial to stir the solutions before plating. Although the solutions are not replenishable, in the case of palladium and rhodium it has been established that at least 80 per cent of the metal content of the solution may be usefully deposited without deterioration either in the quality of the coating or the rate of deposition; it is probable that the other solutions will show a comparable performance in this respect. In the case of palladium, this means that over 1,000 in^2 (0·645 m^2) of surface can be plated with a deposit 50 microinches thick (1·27 microns) from 1 L. of plating solution.

TABLE I—OPERATING CONDITIONS

Metal	Temperature	Rate of Deposition		
		Thickness		Time
	°C	Microinches	Microns	Minutes
Palladium	25	50	1·27	8
	40	50	1·27	5
Rhodium	25	30	0·76	10
Ruthenium	90—100	100	2·54	30
Platinum	65	65	1·65	8

If thinner deposits are required, a proportional decrease in the plating time should be made.

Although the best results are obtained by vat plating, barrel plating of small components may be carried out successfully, provided that rotation of the barrel is restricted to very short intermittent periods, e.g. when the total plating time is 8 min., the barrel should be rotated for periods of 5 sec. only, after 2, 4 and 6 min. of plating. Continuous agitation will lead to exfoliation of deposits. The modified procedure described is quite successful with this type of process, since, provided that each item is in contact with a film of solution, the plating process will proceed despite mechanical masking of components one by another.

If inferior adhesion is observed on surfaces which have been thoroughly cleaned and buffed, this can usually be traced to insufficient degreasing. Loss of brightness of deposits may be due to contamination of solutions and is often remedied by filtering.

Brass may be coated with palladium, rhodium or ruthenium, but good surface preparation is of the utmost importance, particularly where a relatively thick deposit is required. Individual suspension of specimens is desirable wherever possible. The "Atomex" sealing procedure should always be employed to seal deposits of over 10 microinches (0·254 microns) thickness on brass.

Beryllium-copper and nickel-silver can be plated with palladium or rhodium in thicknesses of 20-35 microinches (0·51-0·89 microns) which are also preferably sealed with the "Atomex" methods. These thicknesses represent a plating time of 2 min. at 25°C.; longer times of treatment lead to inferior adhesion of deposits due to the different rates of reaction of the alloy constituents with the plating solution. Ruthenium will give the thickest deposits on alloys. On brass, for example, 100 microinches (2·54 microns) can be satisfactorily deposited in 30 min.

Soldering of palladium-plated copper parts, sealed either by the "Atomex" or boiling water procedures, can be carried out without difficulty using methylated spirit/resin flux or any simple activated resin flux which would be suitable for bare copper.

Parts sealed by the ammonium hydroxide may be readily soldered immediately after plating, but after standing for some time require a 10-sec. dip in 25 per cent hydrochloric acid solution before soldering. Alternatively, they may be soldered using an acid flux.

For other basis metals, fluxes which would normally be used on the bare metal are satisfactory. In the case of coatings on brass, for instance, "Tricene" is the preferred flux, although it is slightly corrosive and should be removed from the work after soldering.

Platers' Problems

Platers and their customers are beset by innumerable problems, and in this series of "question and answer" articles some of these problems will be presented and one solution offered. Readers are invited to suggest, for subsequent publication, other means of overcoming these difficulties satisfactorily

How can we ensure a lasting chromium plated finish on our products, which cover a wide range of builders' hardware? We send out work for bright and satin chrome and find that there is quite a wide variation in price between different trade platers. We produce a high class fitting, but prices must be competitive.

For an effective bright chrome finish which can be relied upon to give satisfactory service over many years it is necessary for the nickel and chrome deposits to be effectively applied to a surface free from defects and to be of sufficient thickness in the areas where corrosion is likely to occur, to provide adequate protection. The plating requirements are most effectively met by ensuring that the finish conforms to British Standard 1224:1959, "Electroplated Coatings of Nickel and Chromium". The quality of the material from which the articles are made is a matter for the manufacturer.

As indicated in Table I, B.S.1224:1959 permits chrome plated finishes to be classified according to the expected service conditions. The proper classification of finishes is extremely important and is the responsibility of the manufacturer when specifying B.S. 1224:1959.

Under "Severe Service" grading may be included motor and motor-cycle fittings such as bumper bars, windscreen frames, wheel rims, rim covers and radiator grilles. Also exposed exterior fittings for buildings.

The "Moderate Service" grading is for articles exposed out of doors in sheltered or in rural conditions and for interior fittings in bathrooms and kitchens where the conditions are fairly corrosive. Interior components for cars would also come under this classification. The wide temperature variations experienced in enclosed areas such as car bodies, with the possibility of condensation occurring, can result in severe corrosive attack.

The "Mild Service" grading is for articles to be used indoors in a warm dry atmosphere. Included in this group are such fittings as lighting units, electric heaters, kitchenware, door fittings. Where articles, such as door handles and hand-rails, are subject to considerable wear in use, it may be necessary to apply a heavier deposit than the service conditions would at first suggest.

Price Variation

In the absence of any specification, there may be considerable variation in the quality offered by different trade platers, particularly if they are not aware of the ultimate use to which the plated components are to be put. This could account for much of the price variation mentioned by the questioner. One cannot, however, assume that the most expensive chrome plate will necessarily be the best.

Satin finishes are produced by a variety of differing techniques, and where an exact match is required much experience is needed; these are additional factors which can affect the price of the plated finish.

A further advantage to be gained from specifying B.S.1224 is that the plater or manufacturer may participate in the Mond nickel scheme for quality

TABLE I—RECOMMENDED DEPOSITS FOR VARYING SERVICE CONDITIONS

Expected Service Conditions	Material from which articles are made		
	Steel	Brass, Copper, Nickel Silver	Zinc-base alloy
Severe Service "Red label" Outdoor Exposure	Classification Ni 12.S. 0·0012 in. Nickel or 0·0010 in. Nickel +0·0003 in. Copper	Classification Ni 6.C. 0·0006 in. Nickel	Classification Ni 10.Z. 0·0010 in. Nickel +0·0003 in. Copper
Moderate Service "Blue label" Kitchens and Bathrooms Outdoor—rural or sheltered situations	Classification Ni 8.S. 0·0008 in. Nickel or 0·0006 in. Nickel +0·0003 in. Copper	Classification Ni 3.C. 0·0003 in. Nickel	Classification Ni 6.Z. 0·0006 in. Nickel +0·0003 in. Copper
Mild Service "Green label" Dry Interior	Classification Ni 4.S. 0·0004 in. Nickel	Classification Ni 3.C as above	Classification Ni 3.Z. 0·0003 in. Nickel +0·0003 in. Copper

*The thicknesses of nickel and copper specified above are those in B.S.*1224:1959 *and are minimum values on the "significant" or required surfaces. The specified minimum value for chromium is* 0·000010 *in. but heavier deposits can with great advantage be applied where a "Crack-Free" type chrome plating solution is employed.*

plating, and label the articles in accordance with the appropriate classification.

Specification Finish

For any specification to be of value, one must be certain that its requirements are met. B.S.1224 includes tests for determining the thickness of the deposit, its adhesion and resistance to corrosion. The degree of control which can, in practice, be applied will depend upon the type of article and on the quantities involved. The testing and, where necessary, re-processing of components will undoubtedly increase the cost of finishing, but in almost every case the advantages to be gained by quality control will fully justify its introduction.

Where the quantities are very large, regular batch test reports could be requested. Occasional samples should be submitted to independent laboratories for test—in connection with the Mond "Confidence in Nickel" campaign, International Nickel Co. (Mond) Ltd. provide thickness test facilities in London and Birmingham, and some of the plating supply houses also provide test facilities. There is not, as yet, any simple, low cost test for the thickness of nickel deposit which the smaller manufacturer could employ for the testing of articles which may have been plated in any one of a number of differing nickel plating solutions.

The application of specification plated deposits to components and the methods of testing to be employed should be discussed with the plater to ensure that a very real effort is made to meet the fairly stringent requirements of the specification. It is possible that a plater may accept an order incorporating a specification requirement without realizing all that it involves and, equally, there are manufacturers who produce components on which it is virtually impossible to apply a deposit which will fully conform to specification requirements.

Important sources of information on the quality of the chrome plate are the examination of any returned components and also the examination of fittings in use. Here, the supplier of builders' hardware has an advantage in that it is usually a simple matter to ascertain how long fittings have been in use and to determine the service conditions. Should early failure of the finish regularly occur at a particular point on a component, it may be possible to re-design the product so that a thicker deposit of nickel can more easily be obtained over the area in question.

To meet the practical limitations of electroplating processes, the specification requirement for minimum thickness of deposit applies only to those areas which can be touched with a 1 in. diameter ball. In recesses, the thickness of deposit is generally well below the average value and premature failure is, therefore, more likely at these points.

There is much that the plater can do to ensure that the plated deposit is reasonably uniform in thickness over the surface. It must, however, be remembered that suitable design enables this to be obtained in the most economical manner.

Advice in Brief

Specify B.S.1224:1959, including the appropriate classification. Choose a plater who will conscientiously follow its requirements. Discuss the design of the product with him; he may be able to suggest minor modifications which will permit the quality of the plated finish to be raised and the plating process to be carried out in a more economical manner.

High Damping Alloys

MANGANESE-COPPER high-damping alloys have been investigated for fatigue properties by the U.S. Bureau of Mines. The results indicate that the aged alloy, with an endurance limit (10^8 cycles) ranging from 29,000 to 36,000 lb/in^2, compares with low carbon steel. These alloys are superior to cast iron and common non-ferrous alloys in respect of fatigue strength as well as mechanical properties. Alloys with 65-80 per cent manganese have relatively low hardness, low strength and high ductility in the solution-treated condition. Those with <78 per cent manganese also have low damping capacity when quenched as solid solution. Formation of α-manganese as a second phase, by ageing at 450-500°C., increases hardness and strength, with high damping capacity in wrought alloys. Considerable variation occurs, however, in the resulting properties, depending on the composition and impurity content of the alloy, and on the temperature and duration of the heat-treatment. Ageing only slightly improves the fatigue strength of the 63·3 per cent manganese alloy, but the 73·5 per cent manganese alloy responded well, and the 80·6 per cent manganese alloy improved even more.

Alloys with 70-75 per cent manganese appear to offer the most latitude for improvement of mechanical and fatigue properties by variation in heat-treatment.

For design considerations, manganese-copper alloys, suitably aged, may be considered equal to mild steel in hardness, tensile strength and fatigue strength. There is a degree of direct correlation between the mechanical and fatigue strengths of these alloys, but no substantial evidence of correlation between specific damping capacity and fatigue strength was encountered.

OUT OF THE MELTING POT

Far Fetched REPORTS that packs of alumina whiskers, in which the average tensile strength of the individual whiskers is 750,000 lb/in^2, have been infiltrated with silver to produce composites with a tensile strength of 118,000 lb/in^2, suggest that, once again, practice, or rather trial and error, have anticipated theory. Not that theory has been neglected: the various aspects of metal-ceramic combinations have already been examined in some detail in connection with cermet compositions, but any conclusions could probably contribute little to the trials and could do little about the errors. Just as, to some extent, in the case of cermets, and very much more so in the case of the more recent metal-fibre-reinforced ceramics, the trials and errors of ceramic-fibre-reinforced metals will be subject to the consequences of attempts to add together materials far more disparate than the proverbial chalk and cheese. While the physical addition of such materials is, of course, possible, the degree of union or integration that can be achieved thereby must, by the very nature of the things, remain limited. There are several limiting factors. There is, to begin with, the adhesion between the metal fibres and the ceramic, or between the ceramic fibres or whiskers and the metal. In the case of the latter combination, while the adhesion may exceed the ultimate tensile strength of the metal, it can hardly be expected to approach that of the whiskers. Then there is the differential expansion. This has already been observed to cause extensive microcracking in metal-fibre-reinforced ceramics, and may be expected to cause loss of adhesion or, less likely, fracture of the ceramic fibre in ceramic fibre-metal composites. This means that the possibility of using ceramic-fibre-reinforced metals at high temperatures does not look very bright, even though originally sound compositions could be prepared by the infiltration technique. In the case of the metal-fibre-reinforced ceramics, the microcracking is a consequence of the initial firing of the composition and, as such, likely to prove unavoidable. As the above limiting factors and difficulties are likely to be less acute in metal-whisker-reinforced metals, one wonders why the combination of alumina whiskers with silver should have been picked for the first trials, when a choice could have been made from a range of metal whiskers and matrix metals in which they would be insoluble.

Current Hopes PATENT specifications, applied for five or six years ago and recently accepted and published, indicate that already in those days techniques for protecting molybdenum against oxidation at high temperatures had reached an advanced stage of development and that some really complex coating systems were being suggested in hope and with no visible signs of desperation (cf. this page, METAL INDUSTRY, 13 October 1961, p. 298). That, five or six years later, hope still survives is suggested by a current report. To quote: "Protective coatings have been developed for molybdenum-base alloys, with the most advantageous coating technique being the pack diffusion process. Known techniques do not produce the required coating integrity, and the present research effort was undertaken to develop a desirable and reproducible coating system. An extensive screening study of various pack diffusion coating systems was made using three basic process concepts. Promising systems were evaluated in detail. Reliability and reproducibility were incorporated into the best coating through a statistical study of the variables affecting the coating process. Evaluation data for two promising systems are presented. Scale-up operation, suitability of methods of fabrication of substrates, non-destructive tests, and repairability are being investigated". It would probably be correct to add that patents are being filed which, in a few years' time, will serve as reminders of these latest achievements for a still hopeful band of research workers in the field of high-temperature oxidation protection of molybdenum.

"Lubricant" AS time goes on, the difficulty of defining a lubricant grows greater and greater. The latest addition to this difficulty comes from a "lubricant" intended for use in the hot deformation of metals by extrusion, piercing and die-forging. As with other lubricants, such as the graphite lubricants used in die-forging and similar operations at present, the object of the new "lubricant" is to prolong the life of the dies, mandrels and punches used in such processes, by improving their lubrication and thereby also reducing the pressure required to deform a given metal. This latest "lubricant" consists wholly or predominantly of a normally solid organic material which burns or volatilizes when trapped between the hot metal and the tool surface and subjected to the operating pressure. The organic material is preferably polyethylene or polyvinyl chloride, but it may be any other material which will be converted completely or substantially completely into gas under the operating conditions. Broadly speaking, all synthetic polymers will behave in this way. It is believed that when a lubricant of this kind is used, practically all the lubrication is effected by a film of gas produced from the organic material at the operating pressure and temperature. The lubricant may be applied in the form of a moulding of suitable shape, or it may be used in the form of granules or powder bound to or enclosed in a combustible carrier, e.g. paper. Conveniently, corrugated paper may be used as a carrier, with the granules or powder of the lubricant being contained in the corrugations, in which they are bound by an organic binder, e.g. a mixture of trichloroethylene and polystyrol, or by cold glue.

Skimmer

Vibratory Finishing

IMPROVED RANGE OF MACHINES FOR DEBURRING AND POLISHING

A VIBRATORY finishing technique which uses an English Electric vibrator motor instead of an eccentric shaft, has been developed by Roto-Finish Limited. Processes which can be carried out with the new machines are deburring, radiusing, descaling, surface blending and polishing.

The machines, ranging from 1 to 10 ft^3, consists of a rubber-lined open steel tub freely mounted on four coil springs. Attached to the base of the tub is a vibrator motor operating at 1,500 r.p.m. The rotary action of the motor induces a gentle circulation of the components and abrasive mass contained in the tub.

At the same time, the vibrating action imparts a random agitation throughout the entire depth of the mass and thus a constant cutting or polishing action is achieved. A variable amplitude of $\frac{1}{32}$ in. to $\frac{1}{4}$ in. is obtained by the setting of the out-of-balance weights on each end of the motor. This technique was adopted after experiments with the alternative method of inducing vibrating movement by means of an eccentric shaft.

The machine is fully enclosed in a mild steel frame to make it practically noiseless in operation. The tub and its frame mounting can be turned through 180° under press button pneumatic controls for loading and unloading.

Compared with rotating barrels the advantages claimed are:

(a) Faster—of the order of five to six times — because the component is worked on for the whole time it is in the tub and not just during the cascade in a barrel.

(b) Greater accuracy as the physical movement of the component is considerably reduced with the cutting media being agitated around the component rather than the component being moved through the mass, thus providing uniformity of radii and surface blending without impingement.

(c) Better control, as the process can be varied from fine finishing to coarse grinding by a simple adjustment of the out-of-balance weights on the vibrator motor.

(d) Permits penetration of crevices, recesses and the inside faces of cup and tube shaped components impossible in the barrelling process.

(e) Gentle action enables fine, delicate or thin sectioned components to be finished without damage or distortion, e.g. laminations of 0·008 in. thickness.

(f) Ease of inspection, as the tub is open and components can be examined at any time throughout the process.

(g) A special re-circulation system incorporated in the machine allows for constant use of same liquid compound during several days' production.

Semi-Automatic

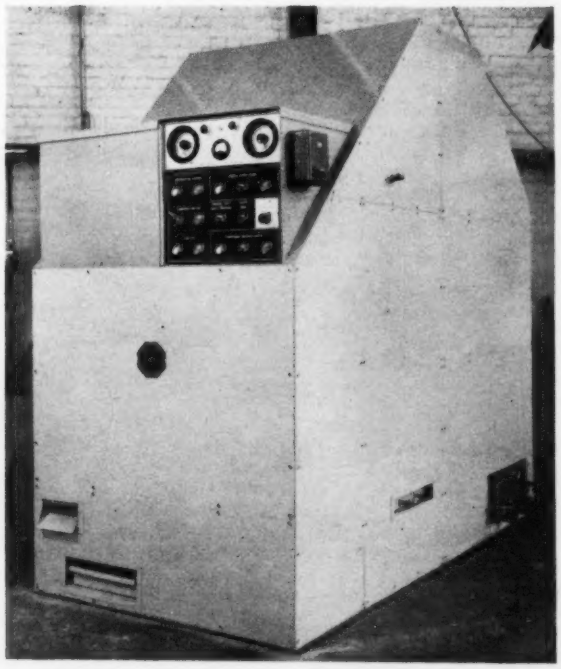
A semi-automatic machine for batch deburring will shortly be installed in a factory in Southern England.

The machine has an adjustable process cycle of 0-4 hr., which can be pre-set by a timer. Capacity is 1,600 components/cycle. The basic parts of the machine consist of a vibrator tub, two bucket conveyor belts, a magnetic separator, and a compound storage tank with pumps.

The components to be treated are loaded into a work hopper whence they are automatically transferred to the

Right—Automatic vibratory finishing machine for batch work

Below—Unloading work from a 7ft³ Osromatic Vibrafinish machine



vibrator tub which already contains the processing media. After discharging the components, the hopper returns to its normal position and signals the vibrator motor to commence the process. At the same time, a pump starts to circulate the processing compound from a storage tank to the tub and thence back to the storage tank. At the completion of the process time, the vibrator motor and pump motor stop, and the vibrator tub tips to discharge both the work and the media into a receiving hopper. During the tipping operation, two bucket conveyor belts, together with the magnetic separator and a rinse spray pump are signalled into operation.

From the receiving hopper, the work and the media are automatically conveyed by means of a conveyor belt, through a spray rinse stage, to the magnetic separator, which diverts the workpieces to a discharge chute, whilst the processing media are directed to a second bucket conveyor belt. This conveyor returns the media to the vibrating tub which, meanwhile, has resumed its operating position.

A separate process timer controls the duration for which the conveyor, the magnetic separator, and the spray rinse pump operate.

When the second process timer has completed its run, the work can be re-cycled automatically or manually.

Continuous Feed

The development of a continuous feed vibrafinishing project is well advanced. In essence, this machine consists of two work tubs in parallel (both tubs being fitted with a scroll form), two conveyor belts, one at each end of the work tubs, to convey material from one tub to the other.

Work is fed, together with the process media, into one end of one of the tubs. The effect of the vibration and the scroll form is to convey the parts and the processing media from one end of the tub to the other. At the exit end, the material is fed on to a cross conveyor, which transfers it to the second tub. At the exit end of the second tub is another cross conveyor with which is incorporated a separating screen so as to allow only the processing media to return to the first tub, the processed components being diverted on to a discharge chute.

In operation, processing compound is constantly circulated through the tubs by means of pressure pumps from two storage tanks; these being separate, two different processes can be carried out in the two tubs—for example, the first tub can deburr and the second tub polish.

The machine at present under development has been designed for a relatively short process cycle time of approximately 15 min., and to take work parts of a maximum size of 3 in. cube. The total capacity of the two tubs is 20 ft^3 of mixed work and processing media. Later machines will be developed for shorter and longer process times. These times are governed by the amplitude of the vibrations, the pitch of the scroll form and the length of the tub.

This continuous feed machine has been expressly designed to cope with the processing of one type of component in flow-line production. However, the machine can also be operated so that the components travel several times through the work tubs as one complete cycle; thus the machine can also be used for batch processing where required.

Standard Specification

Anodic Oxidation Coatings on Aluminium. (*B.S.*1615 : 1961.) *Price* 7*s.* 6*d.*

IN order to bring the specified properties and methods of test into line with current practice, a new edition of B.S.1615—Anodic Oxidation Coatings on Aluminium—has been published.

In this new edition, anodic coatings are classified by their thickness only, without the former reference to the type of electrolyte. The classification has been altered to allow new grades to be systematically incorporated. The standard introduces a 1 micron grade for infra-red reflectors and, at the other end of the scale, a 35 micron grade for special architectural purposes. The thickness test by stripping has been supplemented by a microsection method.

Sealing requirements are now specified by the standard. Effectiveness of sealing is tested by a sulphur dioxide/humidity method similar to the test on chromium plated coatings for corrosion resistance specified in B.S.1224. In fact, the same apparatus can be used.

The measurement of light reflectivity has been simplified by the use of the modified gloss head and the PRS head. The grading for heat reflectivity has been altered, but the method of test remains the same as in the 1958 edition of the standard. Requirements for fastness to light have been upgraded, and it is hoped in due course to provide still higher standards to match the fastness of present-day colour anodized finishes on aluminium.

It has not been found possible to specify an abrasion test, since no one test can be said to be of general application. However, an abrasion test which may be found useful in some cases is described, along with methods of thickness assessment by eddy current instruments and a simplified method of sealing assessment (Kape method) which are recommended for control and acceptance purposes.

Requirements for image clarity, corrosion resistance, leaching resistance and electrical breakdown voltage vary according to the use. Tests for such properties are described, but the extent of testing or the performance is decided by agreement in each case.

The standard offers guidance on the suitability of the aluminium for anodizing, and a list of the information which should be provided with the enquiry and order is given in an appendix.

Copies of the above-mentioned standard may be obtained from the British Standards Institution, 2 Park Street, London, W.1.

Correspondence

Correspondence is invited on any subject considered to be of interest to the non-ferrous metal industry. The Editor accepts no responsibility either for statements made or opinions expressed by correspondents in these columns

Anodizing Aluminium

TO THE EDITOR OF METAL INDUSTRY

SIR, May I first congratulate you on the report of our Anodizing Conference in your issue of 29 September. We very much appreciate the interest and the excellence of the reporting.

There is, however, one statement on Page 242 which, I think, is the reverse of what was intended. It says "One hopes that with the present high standard of technical knowledge on the subject of corrosion of light alloys in service, the aluminium or user industry would not attempt to handle and store aluminium goods in dry, non-humid atmospheres".

I assume that the wording should be "except in dry non-humid atmospheres.

Yours, etc.,

E. G. West,
Technical Director.

The Aluminium Development Association.

Industrial News

Home and Overseas

New London Offices

It is announced by **Universal Metallic Packing Company Limited** that they have now opened London offices at 168 St. Stephen's House, Westminster, S.W.1, where Mr. E. Etherington is in control.

A Training Course

A further "Introduction to Industry" training course is to be held by **Westinghouse Brake and Signal Company Ltd.** at their Chippenham works during the week January 8 to 12 next year inclusive. This is for sixth form boys who will be taking G.C.E. "A" level examinations in scientific subjects in 1963.

The course is designed to give boys a good insight at first hand into the engineering industry, how it works, the training facilities available, and career prospects.

Copper on Show

By incorporating copper and several of its alloys in both the design and construction of their stand at the forthcoming Building Exhibition to be held in London next month, the **Copper Development Association** are able to present with considerable effect the undoubted aesthetic appeal of these metals.

The gleaming copper, bronze, brass or nickel silver employed for these purposes also serve as a reminder of their many more practical applications throughout the building industry. In this respect the C.D.A. are highlighting the adaptability of prefabricated copper plumbing, particularly for multi-storey buildings.

At the same time, other facets of the use of copper and its alloys in building and architecture will be shown, such as its increasingly wide application for all types of domestic heating systems.

Aluminium in Industrial Service

One of the outstanding features of aluminium in industrial service is the universal nature of its applications. This is perhaps best demonstrated by the immensely wide range of uses to which aluminium containers are put in industry for the handling of raw materials during production or processing cycles.

Representative of this usage is the K200S Handbox of the "Lacontainer" range fabricated by **Light Alloy Construction Limited** for use by the plastics manufacturing company, **Marley Extrusions Limited.** This branch of the company manufactures such items as rainwater goods and 4 in. flexible coved-based skirting in the form of PVC extrusions of various colours, and the use of the aluminium handboxes is an important aspect of the good "housekeeping" which is so essential in the plastics industry.

The boxes are of one size, measuring 17½ in. in length, 17½ in. in breadth and 7½ in. in height (all these measurements represent external dimensions), they are fabricated in aluminium alloy BA.25 (Mod.) (HS30W) sheet 1·5 mm. thick, the corners being fillet welded to prevent entrapment of any residual charge which might contaminate a subsequent charge. They are unperforated and have an outer roll rim. For ease of cleaning, chest type handles are fitted, while stacking corner feet aid storage arrangements. One loose lid is provided, this being used to cover the uppermost box in the usual five-high stack.

From this description it will be seen that the boxes are of substantial construction, capable of taking a great deal of punishment, yet they have a tare weight of only 4 lb. with a weight capacity of 50 lb.—a limit fixed for convenience in handling.

Polish Aluminium Contract

According to reports from Paris, Pechiney, the French aluminium producer, has signed a contract with the Polish state body Centrozap, in connection with the construction of Poland's biggest aluminium plant at Konin. Pechiney announced that the contract provides for the setting up within the plant of Pechiney's 100,000 amperes electrolysis equipment.

The plant will have a capacity of 95,000 tons per annum, to be reached in two stages. It is included in the Polish five-year plan—1961 to 1965—and production is scheduled to start in the beginning of 1965.

Materials and Design

On Stand No. D16 at the Engineering Materials and Design Exhibition at Earls Court, London, next month, **Johnson Matthey and Company Limited** will provide a continuous demonstration of low-temperature silver brazing as a means of mass-producing assemblies. A further part of the stand will show Mallory resistance welding electrode materials, including a new series of spot-welding electrodes produced from ½ in. diameter bar, and a new alloy, Mallory 328, developed from Mallory 3 but with better properties at working temperatures.

Many JMC specialized products and materials will also be shown. These will include Mallory 73 beryllium copper, now supplied with beryllia-free surfaces to improve press-tool life, and Mallory 53, a new high-conductivity spring material. A comprehensive range of electrical contacts and contact materials will be shown, and also products for electronic and instrument engineering.

Prominent among the wide range of non-ferrous tube products will be capillary and restrictor tubes. Further sections of the stand will feature JMC products for chemical engineering and the electrodeposition of noble metals.

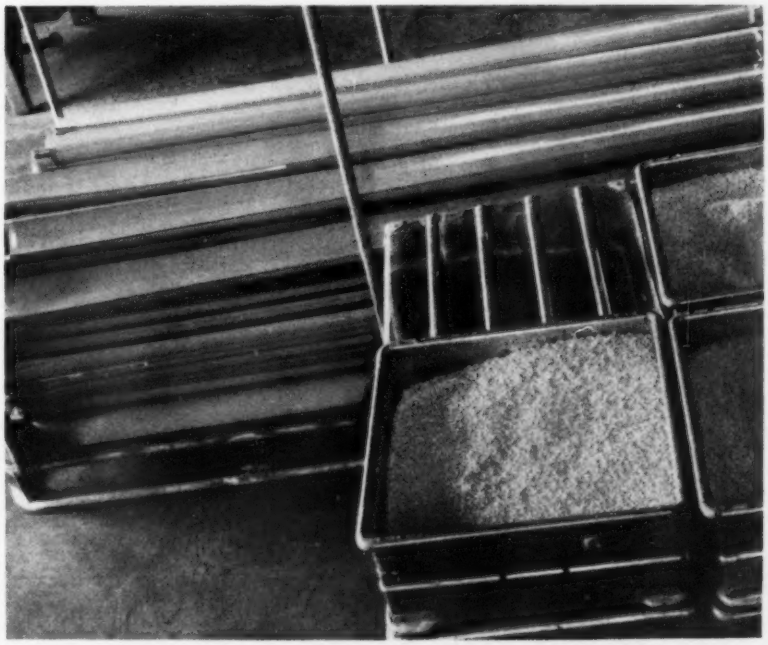
Sole Agents

Appointed sole agents for Devon, Cornwall, Somerset, Dorset, Gloucester and Herefordshire, **Clifford Allin (Engineering) Limited,** of Stroud, will handle technical sales of the shears, presses and metal-working machinery produced by **Joseph Rhodes and Sons Ltd.**

Lead from Russia

In August, 2,300 tons of Russian lead entered the United Kingdom, according to the British Bureau on Non-Ferrous Metal Statistics. These much heavier arrivals resulted in imports so far this year (January to August) of 7,890 tons, compared with the 5,762 tons which arrived over the whole of last year. The greater part—5,700 tons—of this year's arrivals

The raw material and the final product. Stacks of aluminium containers charged with plastic granules and, at the back, some of the rainwater goods produced by Marley Extrusions Ltd.



were concentrated over the June, July and August period. There were no imports of Russian metal in 1959 and only 98 tons in 1958.

The maintenance of this rate of importation over the rest of this year will indisputably place Russia as the third biggest supplier in the United Kingdom market, ousting Spain which held that position last year with a total of 19,656 tons. Both countries, however, are substantially below the two chief suppliers, Australia and Canada, which last year sent 120,705 tons and 44,435 tons respectively.

Furnace Behaviour

A survey of temperature distribution on a blast furnace stove has been completed at Stewarts and Lloyds Ltd., Corby, using a **Honeywell** 40-point data handling unit. By means of a pinboard-programming system the unit processes temperature information on to punched tape, for subsequent computer analysis. The unit worked over a period of ten days under dusty conditions, although it was not designed for such use.

Agreements Made

Reports from **Vickers - Armstrongs (Engineers) Ltd.** state that the company has announced cross-licensing and selling agreements with Racine Hydraulics and Machinery Incorporated, of Wisconsin, U.S.A. This reciprocal agreement will complement the Vickers "VSG" range of oil hydraulic equipment. The company will manufacture Racine hydraulic equipment at its Weymouth works and will distribute it throughout the British Commonwealth and to European markets.

Rolling Mill for Belgium

An order has been placed with **Schloemann Aktiengesellschaft,** by Allegheny-Longdoz S.A., of Belgium, for a reversing cold rolling mill of the type MKW developed by Schloemann. With this new equipment, which will come into operation about the end of next year, alloy steel strip of a width of 52 in. can be rolled down from 0·3 in. to 0·01 in.

A Vacation Course

Organized with the co-operation of the Corrosion Group of the Society of Chemical Industry, the Department of Metallurgy, **Battersea College of Technology,** will hold a vacation course on Cathodic Protection — Instrumentation, Interference and Interference Testing—on December 19 and 20 next.

The course will cover the following aspects of the subject:—Types of tests used in cathodic protection; instruments and characteristics of instruments; commissioning and maintenance instrumentation; special topics—half cells, redox potentials, constant potentials; interference—theoretical principles, interference in practice. One lecture will be devoted to a survey of recent developments in this field. All lectures will be by specialists concerned with work in cathodic protection.

Fee for the course is £6. Enrolment forms and further information may be obtained from the Secretary (Metallurgy Courses) Battersea College of Technology, London, S.W.11.

Induction Heating Equipment

One of the members of the Simms group of companies, Horstman Ltd., of Bath, have placed an order with **Wild-Barfield Electric Furnaces Ltd.** for the supply of high frequency induction heating equipment.

The generator will be a 36 kW model with two-station output. One station will feed a Wild-Barfield A.H.F. progressive hardening unit, which equipment will be employed for the pattern hardening of shafts. The other will be used as a general purpose station for hardening, brazing, or any other application required within the scope of the equipment.

Fire Precautions

Every day the Joint Fire Research Organization receives enquiries from architects, consultants and local authorities on the best means of producing buildings to meet the fire regulations without using uneconomic methods of construction or having unnecessary restrictions placed upon them.

"Fire-Resistance of Floors and Ceilings" is the first of a new series of fire notes based on these enquiries. It describes a series of large-scale tests which the organization at Boreham Wood has carried out in connection with British Standard 476, which grades structural elements by their ability to perform the functions for which they were designed, when exposed to fire.

The booklet contains recommendations for achieving reasonable fire resistance in floors and ceilings, including the conversion of old buildings and the repair of buildings after a fire. The Joint Fire Research Organization is a body jointly run and financed by the Department of Scientific and Industrial Research, and by the fire insurance companies who are members of the Fire Offices' Committee, together with practically all the independent and mutual offices.

Vacuum Furnaces

As from November 1 next, the vacuum furnace activities of **Efco Furnaces Limited** will be handled by a new division with offices, design and manufacturing facilities at Sheerwater, near Woking. Mr. M. J. Severs, B.Sc., A.M.I.Mech.E., formerly with the furnace department of The General Electric Company Limited, has been appointed technical manager of the new division, and Mr. W. Huyser, B.Sc., previously vacuum sales manager of General Engineering Company (Radcliffe) Limited, has been appointed sales manager.

Forthcoming Meetings

November 1—Institute of Metal Finishing. Scottish Branch. Grand Hotel, Charing Cross, Glasgow. "Chromium Plating." H. Cann. 7.30 p.m.

November 2 — Institute of Metals. London Local Section. Royal School of Mines, London, S.W.7. "The Design of Strong Materials." Dr. A. H. Cottrell. 7 p.m.

November 2—Institute of Metal Finishing. North-West Branch. Engineers' Club, Albert Square, Manchester. Speaker—Dr. Gardam.

November 2 — Institution of Electronics. The Leeds College of Technology, Calverley Street, Leeds, 1. A Film Show on Electronic Topics. 7 p.m.

November 3 — Institution of Electronics. Lecture Theatre, Radiant House, Bold Street, Liverpool, 1. A Film Show on Electronic Topics. 7 p.m.

Control Valves

It has been announced that **Ether Limited** have introduced another addition to their range of control valves. Type VPH has been developed for hydraulic and pneumatic servo duties. It is capable of operating in the pressure range of 250 to 3,000 lb/in^2 and incorporates $\frac{1}{4}$ in. dia. orifice and $\frac{1}{8}$ in. B.S.P. connections. This valve is available in brass or stainless steel construction.

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange official warehouses at the end of last week fell 202 tons to 4,555 tons, comprising London 1,616, Liverpool 1,490 and Hull 1,449 tons.

Copper stocks fell 2,035 tons to 16,150 tons, distributed as follows: London 450, Liverpool 13,200, Birmingham 50, Manchester 2,375, Hull 50, and Glasgow 25 tons.

Lead duty-free stocks rose 25 tons to 7,082 tons, comprising London 6,632, Glasgow 200, Swansea 100, and Manchester 15 tons. In-bond stocks remained unchanged at 3,527 tons, all in London.

Zinc duty-free stocks rose 695 tons to 7,364 tons, comprising London 2,753, Glasgow 81, Hull 425, Manchester 300, Liverpool 55, and Avonmouth 3,750 tons. In-bond stocks rose 85 tons to 3,038 tons, all supplies in London.

Canadian Production

More copper, nickel, lead and zinc was produced in August this year compared to August 1960, but less silver. Totals were higher in the January-August period as compared to a year earlier for nickel and lead, and lower for copper, silver and zinc.

Production of these metals in August was: copper 38,220 tons (37,996 a year earlier); nickel, 20,171 tons (19,142); silver, 2,223,460 fine ounces (2,650,110); lead, 19,584 tons (16,801); and zinc, 35,936 tons (33,126). January-August production figures were: copper, 293,780 tons (297,754 a year ago); nickel, 149,981 tons (141,691); silver, 20,328,490 fine ounces (21,843,459); lead, 148,241 tons (134,769); and zinc, 253,722 tons (270,852).

New Factory

The site of a new factory being built for **Fine Tubes Limited** at Estover, near Plymouth, was toured recently by the Lord Mayor, Alderman A. Goldberg, and a party of officials from The Industrial Estates Management Corporation for England. The company hopes to be in production at Plymouth by late Spring 1962.

Production will also be maintained at Surbiton, and the managing director, Mr. Malcolm Rowe, expects that the end of 1962 will see a 50 per cent increase in overall output—a situation bringing about a shortening of delivery dates and extension of the range of analyses available.

Heat-Resisting Iron Crucibles

From **Lees Hall and Sons Ltd.** comes a new leaflet describing various types of heat-resisting iron crucibles which are largely used by melters of metals, especially zinc and other soft metals. Statistics and diagrams form an important part of this leaflet. A large range of melting furnaces of all kinds are also manufactured by this company.

Corrosion News

At the 25th Jubilee Congress of the German Society for Fat Research, being

held in Hamburg this week, the only British Paper was given by Mr. M. K. Schwitzer, a director of **Armour Hess Chemicals Ltd.** The title was "New Ways in Preventing Corrosion by Means of Cationic Chemicals". The Paper dealt partly with theoretical aspects, partly with the application of these products in oil primers, as filming amines in steam condensate systems and in the control of corrosion, including that caused by micro-organisms, in oil wells.

New Adhesive

Co-operating with a leading car manufacturer, **B.B. Chemical Company Limited** are reported to have developed a metal-to-metal adhesive which is said to be already causing changes in certain car production techniques. The bonding substance is a tough, flexible solvent-free adhesive with gap-filling properties and high peel strength, suitable for application to steel and aluminium.

This is a heat-gelling compound, designed for metal bonding where the assembly will subsequently be heat-treated, thus curing the substance to a tough, rubbery consistency. Tolerant of oil contamination, the adhesive is readily extruded, by virtue of its thixotropic nature, through lengths of ½ in. bore, high-pressure hose. Neither in the cold state nor during cure will the compound flow, and the minimum cure-time is 30 min. at 270° F., though the bond is not impaired if the cure-time is exceeded. On test, a bond subjected to 360° F. for 3½ hr. survived without the slightest degradation.

The compound itself is non-inflammable, non-drying, with good storage properties, and the curing cycle was planned around temperatures commonly used in the automobile industry's paint shops. Without spending time on welding and strut-work, rigid structures are obtained, and not only cars, but filing cabinets, aluminium doors, domestic equipment—in fact, any sheet-metal structure with a high, oven-baked enamel finish, it is said, could be speedily assembled with this metal-to-metal adhesive.

Rhodesia Mining Order

From Salisbury, Barclays Bank D.C.O. reports that the Southern Rhodesia Government has granted an exclusive prospecting order in respect of nickel over approximately 146 sq. miles in the Hartley mining district in favour of **Rhodesian Selection Trust Exploration Ltd.** The company must spend £35,000 on operations within the reservation before the order expires at the end of September 1964.

Independent Consultants

Publication of a new edition of the **Royal Institute of Chemistry's** Directory of Independent Consultants in Chemistry and Related Subjects brings to notice the wide range of consultant services offered by independent practices operated and controlled by Fellows or Associates of the Institute in Great Britain and Ireland.

In order that the nature and scope of these services and their value to industrial firms, public bodies and other organizations and individuals may be made better known, copies of this edition of the directory are being widely distributed. A copy will also be sent on request, without charge, to anyone who may be concerned with obtaining such services.

By these means, the institute aims not only to draw attention to the work of its consultant members, who are committed to acceptance of restraints imposed by it on overt individual advertising of their practices, but also to serve the public interest by enabling everyone readily to obtain the specialist advice and help they may need on matters directly or indirectly related to chemistry.

New Thread Restorer

A new tool to roll all types of damaged and rusted threads back into shape without removing any thread metal has been introduced by **G. E. Simm Engineering Ltd.** Ten models are available for threads varying from a minimum outside diameter of ¼ in. (6 mm.) to a maximum outside diameter of 12 in. (300 mm.).

The tool is the Buckingham thread restorer which, the makers say, can chase and restore all types of battered and rusted threads in a matter of minutes. One Buckingham tool can, it is said, restore a full range of right-hand and left-hand, metric, S.A.E., U.S.S., and Whitworth threads, and where the damaged thread is part of an assembly, the part usually need not be dismantled.

In operation, the tool is applied to the bottom thread with its blades in the direction of operation, the blade jaws are closed until the die blades fit snugly into the pitch of the thread and the tool is then turned manually towards the operator until it comes off.

Die-Casting Discussion Group

Following the success of the technical discussion meetings on die-casting practice and techniques arranged by the **Zinc Alloy Die Casters Association** last winter, the first of this season's meetings was held on Tuesday of last week in the Council Room of the Birmingham Chamber of Commerce.

The chair was taken by Mr. Turner, of Metal Castings Doehler Ltd., and the subject for discussion was "Metal Melting and Handling". The subject was introduced by Mr. Newby, of the Birmingham Aluminium Casting (1903) Co. Ltd., who

Metal Statistics

Detailed figures of the consumption and output of non-ferrous metals for the month of August, 1961 have been issued by the British Bureau of Non-Ferrous Metal Statistics, as follows in long tons:—

COPPER	Gross Weight	Copper Content
Wire	15,848	15,517
Rods, bars and sections	10,429	6,653
Sheet, strip and plate	9,422	7,385
Tubes	6,175	5,804
Castings and miscellaneous	6,655	—
Sulphate	430	—
	48,959	40,920
Of which:		
Consumption of Virgin Copper		31,003
Consumption of Copper and Alloy Scrap (Copper Content)		9,917

LEAD	
Cables	5,900
Batteries	1,875
Battery Oxides	2,636
Tetra Ethyl Lead	1,986
Other Oxides and Compounds	1,021
White Lead	533
Shot	368
Sheet and Pipe	5,558
Foil and Collapsible Tubes	239
Other Rolled and Extruded	495
Solder	1,175
Alloys	1,547
Miscellaneous Uses	1,493
Total	24,816

TIN	
Tinplate	587
Tinning:	
Copper Wire	32
Steel Wire	7
All other	62
Solder	150
Alloys	444
Foil and Collapsible Tubes, etc.	36
Tin Compounds, Salts, and Miscellaneous Uses	128
Total Consumption	1,446

ZINC	
Galvanising	6,788
Brass	7,121
Rolled Zinc	1,911
Zinc Oxide	1,439
Zinc Die-casting alloy	2,806
Zinc Dust	562
Miscellaneous Uses	874
Total, All Trades	21,501
Of which:	
High purity 99·99 per cent	3,261
Electrolytic and high grade 99·95 per cent	3,735
Prime Western, G.O.B. and de-based	9,123
Remelted	366
Scrap Brass and other Cu alloys	2,979
Scrap Zinc, alloys and residues	1,845

ANTIMONY	
Batteries	145
Other Antimonial Lead	44
Bearings	20
Oxides—for White Pigments	88
Oxides—other	70
Miscellaneous Uses	11
Sulphides	6
Total Consumption	384
Antimony in scrap	
For Antimonial Lead	336
For Other Uses	64
Total Consumption	400

CADMIUM	
Plating Anodes	43·80
Plating Salts	6·50
Alloys: Cadmium Copper	5·05
Alloys: Other	2·10
Batteries: Alkaline	3·45
Batteries: Dry	0·25
Solder	3·80
Colours	15·25
Miscellaneous Uses	1·50
Total Consumption	81·70

went on to talk about aluminium alloys, and Mr. Lodder, of Imperial Smelting Corporation Ltd., dealt with zinc alloys. The discussion centred largely on the technique of remelting aluminium scrap and the maintenance of zinc alloy composition within specification.

The next meeting in the series will be in London on Monday, November 20, and details may be obtained from the offices of the Association.

A New Company

Formed to take over and develop the engineering activities of The General Electric Company Limited, a new company, to be known as **G.E.C. (Engineering) Limited** will comprise the electrical engineering works at Witton and the mechanical engineering works at Erith. The total number of employees exceeds 15,000.

The board of directors of the new company will operate from headquarters in London, negotiations for the acquisition of suitable premises for which are at present in progress.

Aluminium in Greece

An agreement for the formation of a Greek corporation which will process aluminium for the production of a complete line of semi-fabricated aluminium products, including aluminium foil, has been signed between the Greek copper and aluminium industry Viochalco and the French firms of Pechiney and Ugine. Announcing this, the Greek Ministry of Industry said that the corporation will have a capital of 60 million drachmas, 75 per cent from Viochalco and the remaining 25 per cent from the French firms.

The agreement provides that as soon as the Acheloos aluminium production plant is operating, which is to be established and operated with the assistance of the French firms, the new Greek plant will exclusively use locally produced aluminium, and will try to export the product in the form of semi-fabricated or fabricated products.

Metal Handbook

Just published is the 1960 edition of **Quin's Metal Handbook**, which comprises 648 pages and contains a wealth of information covering numerous countries relating to prices, production, consumption, exports, imports, destinations and sources, brands and stocks of non-ferrous metals, ores, scrap, iron and steel, ferro-alloys, tinplates, etc. Concisely indexed, quick and easy reference to any metal in any part of the world is readily obtainable.

This edition has been completely revised and a new feature, introduced last year for the first time, provides extracts from the official Soviet Union foreign trade statistics, relating to the exports and imports of ferrous and non-ferrous metals covering the years 1958 and 1959. Priced at £1 15s. 0d. post free, copies may be obtained from Metal Information Bureau Limited, 27 Albemarle Street, London, W.1.

News from Birmingham

The activity in the heavy electrical industries benefits the makers of copper wire and cable, and there is a good demand for copper for this purpose. There is better news for at least one of the big motor firms, which has secured enough business recently to warrant full capacity working for at least twelve months. But taking the industry as a whole, there is still a good deal of short time working, and the continuance of the labour disputes has a serious effect on output. Brassfounders are fairly busy on components. The light engineering industries are good buyers of raw material.

Little change has taken place in the iron and steel trade. Some iron furnaces have closed owing to lack of demand. Those still functioning can take care adequately of all market demands. The firmness in the trade for constructional steel is maintained. An exceptional amount of rebuilding of office blocks and commercial premises is taking place, though the giving out of new orders is now beginning to slow down. Re-rolling mills are operating below capacity. There has been a substantial drop in the amount of imported steel since the beginning of this year. Supplies of semi-finished steel are ample and can be obtained promptly from British works.

News from Scotland

It is reported from Glasgow that the Fairfield Shipbuilding and Engineering Co. Ltd., of Glasgow, is to spend £1,000,000 on a new platers shop and stockyard. They have already spent £3,000,000 on the modernization of their yard, this new stage being the final one in the redevelopment plan. Fairfield plan to have a completely efficient "factory-line" layout, allowing maximum speed, efficiency and economy in the handling of steel and plates so that factory techniques can be applied as far as possible to the work of shipbuilding. The firm plans to install a variety of machines not used in other yards and to organize on completely new concepts for the shipbuilding industry.

Barnes and Bell Ltd., of Glasgow, one of the oldest firms in the metal trade in the West of Scotland, have added a fourth Coatbridge works to their scrap metal processing facilities. They have purchased the former Woodside Steel at Coatbridge from the Iron and Steel Holding Realisation Agency and will occupy the five acre site at an early date. They already have the Barbell, Zenith and Prospect works at Coatbridge, and with this new addition will be in a position to expand substantially their metal processing, refining and disposal activities.

Copper in India

According to reports from Bombay, deposits of copper ore with 1 per cent to 5 per cent metal have been found at Thaneswasla, in the Chanda district. A detailed survey was required to assess the extent of the area covered with deposits, which spreads on both sides of the River Vainganga.

Company Reports

Minworth Metals Ltd.

Dividend 30 per cent for year to July 31, 1961 (same). Group net profit £91,460 (£91,339), after tax £100,172 (£88,431).

Wallis Tin Stamping

A final dividend of 16¼ per cent for the year ended June 30, 1961, makes 25 per cent for the seventh successive year. The net profit has risen from £46,988 to £69,123, after tax of £37,372 (£31,069).

Samuel Smith and Sons

Group profit year to June 30, 1961, £37,821 (£37,280), before tax £17,863 (£17,406), and dividend 20 per cent (same). Current assets £143,857 (£135,883) and liabilities £43,615 (£37,496).

Trade Publications

Co-ordinate Table.—Dowding and Doll Ltd., 346 Kensington High Street, London, W.14.

A three-fold brochure illustrates and describes this company's "Atlantic" co-ordinate table with Ferranti numerical positioning. When fitted to the bed of a radial drill, this equipment enables any number of hole centres to be positioned quickly and accurately without jigs or marking out. The system is electronically operated, and is stated to be equally efficient when applied to one-off or batch production. Modifications can be made to any layout quickly and easily, at the cost of a few pence.

Industrial Ovens and Filtration Equipment—Controlled Heat and Air Ltd., Cornwall Road, Smethwick, Birmingham.

This is an eight-page brochure drawing attention to the activities of this company in the whole field of stoving, drying, low temperature heat-treatment, etc., up to a maximum of 450°C. A number of excellent illustrations are included.

Modern Foundry Practice. — The Gas Council, Murdoch House, 1 Grosvenor Gardens, London, S.W.1.

Under this title, a new illustrated publication on the application of town gas in the foundry is now available. Ferrous, non-ferrous and light metal foundries are all covered within its twelve pages. The object of the brochure is to bring to the attention of foundry personnel some of the recent developments in the application of gas to the foundry.

Foliac Applications.—Graphite Products Limited (Morgan Crucible Group), Northfields, Wandsworth Park, London, S.W.18.

New literature recently produced by this company deals with Foliac products and includes leaflets, brochures, etc., covering colloidal dispersions, red jointing, colloidal graphite in water and in alcohol, and also thread compound 991. Statistical data is given and details of applications included in each case.

Pyrometer Sheaths.—The Morgan Crucible Group, Battersea Church Road, London, S.W.11.

A new coloured leaflet deals with the company's "Metamic" pyrometer sheaths and states that these sheaths are impervious and very refractory. They have cold strength equal to cast iron, excellent thermal shock resistance and slag resistance, with high thermal conductivity. Sizes, data and illustrations are included in the leaflet.

Metal Market News

DETAILS of the September statistics in regard to copper were made available in New York by the Copper Institute last week. The figures, in short tons of 2,000 lb., are as follows: Inside the United States, production of crude copper was 110,186 tons against 95,570 tons in August, while the output of refined was about 20,000 tons down at 126,023 tons. Deliveries to consumers at 126,744 tons compared with a total of 121,484 tons in the previous month, while stocks of refined copper in producers' hands dropped from 95,177 tons at August 31 to 77,813 tons at the end of September. Outside the United States, production of crude copper was about 8,000 tons up at 180,034 tons, while the output of refined metal also increased, from 142,356 tons to 155,919 tons. Deliveries of refined copper to consumers showed an improvement of 9,200 tons at 178,335 tons. Stocks of refined copper showed little change, the September figure of 325,858 tons being about 4,000 tons down. Against this background of reduction in world stocks it has to be reported that a further marked drop in the tonnage of copper held in Metal Exchange warehouses occurred at the beginning of last week. This time, the fall amounted to 2,325 tons, bringing the total down to 18,185 tons, and there is no certainty that the downward movement has been arrested.

There is no secret about the fact that the bulk of the copper comprising the L.M.E. reserves comprises fire refined grade, and there is a feeling in some quarters that a considerable tonnage of this copper may have been shipped abroad for conversion into electro. This shape commands a premium of around £8 to £10 at present, so that the operation could well be profitable. The market, however, was quite unaffected by this further drop in the L.M.E. tonnage, for outside demand is very poor and business in physical copper last week was on a very small scale. The turnover in the standard copper ring, including carries, amounted to about 12,000 tons, both cash and three months finishing level at £230 5s. 0d. This meant a decline of £1 15s. 0d. in cash and of £2 in three months. In the States, the producers' and custom smelters' quotations were unchanged at 31 cents and there does not seem to be any reason to suppose that any alteration will be made in the near future. Values on Comex fluctuated very much in line with London, but there was a reduction in the quotation for scrap copper as smelters lowered their buying limit.

As to the other metals, nothing of any interest emerged but, on balance, prices drifted rather lower. An interesting feature in tin was the sharp contraction in the contango from £9 to £5, and there is every prospect of this process continuing, for stocks in official warehouses are declining. Last week's report gave a fall of 252 tons to 4,757 tons. Consumer business is fairly good but the decline in activity in the steel trade is making a difference. Last week saw a further disposal of G.S.A. metal in the States. Zinc stocks increased last week by 1,245 tons to 9,622 tons, and the market closed 5s. down for both positions at £72 10s. 0d. cash and £73 10s. 0d. forward. In lead, stocks fell by 225 tons to 10,584 tons, and the market closed unchanged for cash at £63 5s. 0d., and 5s. lower for three months at £64 10s. 0d.

New York

Copper futures, after early steadiness, declined a little on scattered weekend selling. Dealings were modest. Physical copper showed little change. Dealers noted quiet, steady conditions in the export market. Their domestic offerings were slightly below 31 cents and met little demand. Producers continued to sell satisfactorily for November, while custom smelters still have no complaints about November sales so far. Scrap copper was unchanged.

Paris

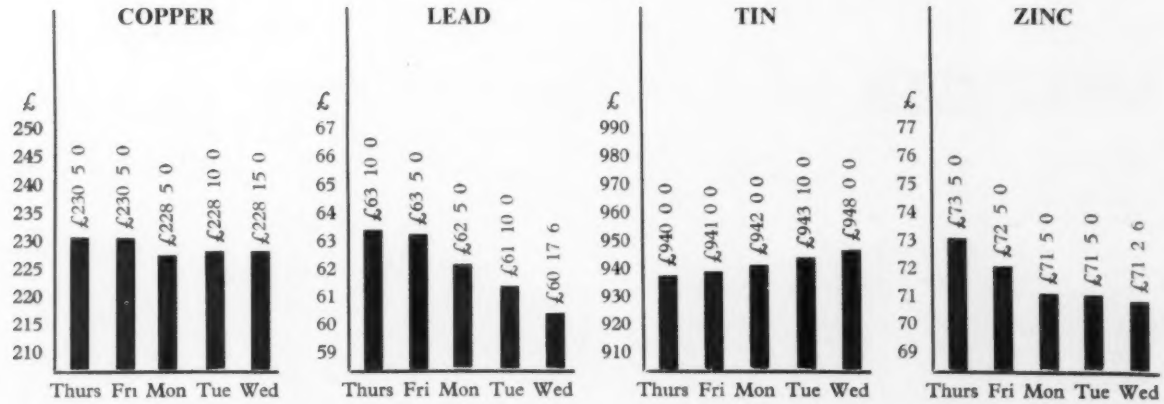
According to reports from the French capital, the application by the United Kingdom to join the "Six" is not being particularly welcomed by the French aluminium industry. There is said to be a feeling in Paris that the British aluminium industry, which is described as being under the domination of the U.S. and Canada, might dominate, in turn, the aluminium industries of the Six. It is pointed out that Britain receives no less than 60 per cent of its metal from the U.S., automation is now highly developed and, finally, prices are well below those of Europe.

The French believe that North America, that is Canada and the U.S., will concentrate on exports. Steps have already been taken in this direction with the setting up of American concerns in Europe. Aleurpoe is given as the example. If Britain comes into the Common Market they see the threat developing even to a point of suffocation.

It is too early to be able to foresee what is likely to happen, but it is expected that France will use her strength in other fields to try and limit the effects of Britain's entry on aluminium.

London Metal Exchange

Thursday 19 October to Wednesday 25 October 1961



C

NON-FERROUS

PRIMARY METALS

All prices quoted are those available at 2 p.m. 25/10/61

		£	s.	d.
Aluminium Ingots	ton	186	0	0
Antimony 99·6%	,,	237	10	0
Antimony Metal 99%	,,	230	0	0
Antimony Oxide Commercial	,,	194	10	0
Antimony White Oxide	,,	212	0	0
Arsenic	,,	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	,,		11	0
Calcium	,,	2	0	0
Cerium 99%	,,	15	0	0
Chromium	,,		6	11
Cobalt	,,		12	0
Columbite	per unit		8	10	0
Copper H.C. Electro	ton	228	15	0
Fire Refined 99·70%	,,	227	0	0
Fire Refined 99·50%	,,	226	0	0

		£	s.	d.
Copper Sulphate	ton	78	0	0
Germanium	grm.		—	
Gold	oz.	12	9	11½
Indium	,,		10	0
Iridium	,,	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	60	17	6
Magnesium Ingots	lb.			
99·8%	,,		2	2½
99·9+%	,,		2	3
Notched Bar	,,		2	9½
Powder Grade 4	,,		5	6
Alloy Ingot. AZ91X		1	11¾-2	1¼
Manganese Metal	ton	280	0	0
Mercury	flask	60	0	0
Molybdenum	lb.	1	15	0
Nickel	ton	660	0	0
F. Shot	lb.		5	11
F. Ingot	,,		5	11
Osmium	oz.	20	0	0
Osmiridium	,,		—	

		£	s.	d.
Palladium	oz.	9	0	0
Platinum	,,	30	5	0
Rhodium	,,	46	0	0
Ruthenium	,,	16	0	0
Selenium	lb.	2	6	6
Silicon 98%	ton	123	0	0
Silver Spot Bars	oz.		6	8
Tellurium Sticks	lb.	2	0	0
Tin	ton	948	0	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	,,		—	
Virgin Min 98%	,,	71	11	3
Dust 95/97%	,,	118	10	0
Dust 98/99%	,,	124	10	0
Granulated 99+%	,,	96	11	3
Granulated 99·99+%	,,	108	1	3

**Duty and Carriage to customers' works for buyers' account.*

INGOT METALS

All prices quoted are those available at 2 p.m. 25/10/61

Aluminium Alloy (Virgin)	£	s.	d.
B.S. 1490 L.M.5	ton	nom.	
B.S. 1490 L.M.6	,,	,,	
B.S. 1490 L.M.7	,,	,,	
B.S. 1490 L.M.8	,,	,,	
B.S. 1490 L.M.9	,,	,,	
B.S. 1490 L.M.10	,,	,,	
B.S. 1490 L.M.11	,,	,,	
B.S. 1490 L.M.12	,,	,,	
B.S. 1490 L.M.13	,,	,,	
B.S. 1490 L.M.14	,,	,,	
B.S. 1490 L.M.15	,,	,,	
B.S. 1490 L.M.16	,,	,,	
B.S. 1490 L.M.18	,,	,,	
B.S. 1490 L.M.22	,,	,,	
Aluminium Alloys (Secondary)			
B.S. 1490 L.M.1	ton	150	0	0
B.S. 1490 L.M.2	,,	150	0	0
B.S. 1490 L.M.4	,,	159	0	0
B.S. 1490 L.M.6	,,	176	0	0
***Aluminium Bronze**				
BSS 1400 AB.1	ton	237	0	0
BSS 1400 AB.2	,,	245	0	0

		£	s.	d.
***Brass**				
BSS 1400-B3 SCB2	ton	175	0	0
BSS 249	,,	171	0	0
***Gunmetal**				
B.S. 1400: LG2 d/d	,,	210	0	0
B.S. 1400: LG3 d/d	,,	220	0	0
B.S. 1400: GI 1½ Pb d/d	,,	280	0	0
B.S. 1400: GI ½ Pb d/d	,,	294	0	0
***Manganese Bronze**				
BSS 1400 HTB1	,,	191	0	0
BSS 1400 HTB2	,,	211	0	0
BSS 1400 HTB3	,,	237	0	0
Nickel Silver				
Casting Quality 12%	,,	255	0	0
,, ,, 16%	,,	265	0	0
,, ,, 18%	,,	310	0	0
***Phosphor Bronze**				
B.S.1400P.B.1.(A.I.D. released)	,,	312	0	0
B.S. 1400 L.P.B.1	,,	235	0	0

**Average prices for the last week-end.*

Phosphor Copper	£	s.	d.
10%	ton	254	0	0
15%	,,	257	0	0
Phosphor Tin				
5%	,,	1020	0	0
Silicon Bronze				
BSS 1400-SB1	,,	280	0	0
Solder, soft, BSS 219				
Grade C Tinmans	,,	422	0	0
Grade D Plumbers	,,	333	15	0
Grade M	,,	466	0	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9	,,	,,	—	
Zinc Alloys				
BSS 1004 Alloy A	ton	101	11	3
BSS 1004 Alloy B	,,	105	11	3
Sodium-Zinc	lb.		2	6

SCRAP METALS

Merchants' average buying prices delivered, per ton, 24/10/61

Aluminium	£
New Cuttings	134
Old Rolled	100
Segregated Turnings	72
Brass	
Cuttings	155
Rod Ends	142
Heavy Yellow	132
Light	127
Rolled	143
Collected Scrap	129
Turnings	134

Copper	£
Wire	199
Firebox, cut up	197
Heavy	196
Light	193
Cuttings	204
Turnings	188
Braziery	162
Gunmetal	£
Gear Wheels	196
Admiralty	196
Commercial	177
Turnings	172

Lead	£
Scrap	53
Nickel	
Cuttings	—
Anodes	590
Phosphor Bronze	
Scrap	177
Turnings	172
Zinc	
Remelted	64
Cuttings	54
Old Zinc	35

METAL PRICES

SEMI-FABRICATED PRODUCTS

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products

		£	s.	d.
Aluminium				
Sheet 10 S.W.G.	lb.		2	10½
Sheet 18 S.W.G.	,,		3	0½
Sheet 24 S.W.G.	,,		3	3½
Strip 10 S.W.G.	,,		2	10½
Strip 18 S.W.G.	,,		2	11½
Strip 24 S.W.G.	,,		3	1
Circles 22 S.W.G.	,,		3	4½
Circles 18 S.W.G.	,,		3	3½
Circles 12 S.W.G.	,,		3	2½
Plate as rolled	,,		2	10
Sections	,,		3	4
Wire 10 S.W.G.	,,		3	1½
Tubes 1 in. o.d. 16 S.W.G.	,,		4	4
Aluminium Alloys				
BS 1470. HS19W.				
Sheet 10 S.W.G.	,,		3	3
Sheet 18 S.W.G.	,,		3	5½
Sheet 24 S.W.G.	,,		4	1
Strip 10 S.W.G.	,,		3	3
Strip 18 S.W.G.	,,		3	4½
Strip 24 S.W.G.	,,		4	0½
BS1477. HP30M.				
Plate as rolled	,,		3	1
BS1470. HC15WP.				
Sheet 10 S.W.G.	,,		4	3
Sheet 18 S.W.G.	,,		4	8½
Sheet 24 S.W.G.	,,		5	8½
Strip 10 S.W.G.	,,		4	4
Strip 18 S.W.G.	,,		4	8½
Strip 24 S.W.G.	,,		5	4½

		£	s.	d.
Aluminium Alloys—cont.				
BS1477. HPC15WP.				
Plate heat treated	lb.		3	10½
BS1475. HG19W.				
Wire 10 S.W.G.	,,		4	2
BS1471. HT19WP.				
Tubes 1 in. o.d. 16 S.W.G.	,,		5	5
BS1476. HE19WP.				
Sections	,,		3	4
Split tube				
19 S.W.G. (⅛″)	,,		4	2
20 S.W.G. (⅜″)	,,		3	11
21 S.W.G. (¼″)	,,		4	1
22 S.W.G. (¼″)	,,		4	11
Welded tube 14 to 20 S.W.G. (sizes ½″ to 1½″)	,,	3	10½ to 5	8½
Brass				
Tubes	lb.		1	9¾
Brazed Tubes	,,		3	1¾
Drawn Strip Sections	,,		3	1¾
Sheet	ton	195	10	0
Strip	,,	195	10	0
Extruded Bar	lb.		2	0
Condenser Plate (Yellow Metal)	ton	184	0	0
Condenser Plate (Naval Brass)	,,	198	10	0
Wire	lb.		2	8¾

		£	s.	d.
Beryllium Copper				
Strip	lb.		1	4 11
Rod	,,		1	1 6
Wire	,,		1	4 9
Copper				
Tubes	lb.		2	3¾
Sheet	ton	266	0	0
Strip	,,	266	0	0
H.C. Wire	,,	283	5	0
Cupro Nickel				
Tubes 70/30	lb.		3	8¼
Lead				
Pipes (London)	ton	103	5	0
Sheet (London)	,,	101	0	0
Tellurium Lead	,,	£6 extra		
Nickel Silver				
Sheet and Strip 10%	lb.		3	11¾
Wire 10%	,,		4	4¾
Phosphor Bronze				
Wire	,,		4	2⅛
Titanium (1,000 lb. lots)				
Billet 4½″ to 18″ dia.	lb.	47/-		48/-
Rod ½″ to 4″ dia.	,,	85/-		53/-
Wire ·036″-·232″ dia.	,,	159/-		99/-
Strip ·001″ to ·048″	,,	350/-		68/-
Sheet 8′×2′. 20 gauge	,,	73/-		
Tube, representative average gauge	,,	198/-		
Extrusions	,,	90/-		
Zinc				
Sheet	ton	109	5	0
Strip	,,	nom.		

FOREIGN QUOTATIONS

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

Belgium	fr/kg	£/ton
Copper: electrolytic	31.75	232 1
Tin	131.70	962 11

Canada	c/lb	£/ton
Aluminium	24.00	194 8
Copper: electrolytic	30.00	243 0
Lead	10.50	81 0
Nickel	70.00	567 0
Zinc: Prime western	12.00	97 4
High grade 99.95	12.60	102 1
High grade 99.99	13.00	105 6

France	fr/kg	£/ton
Aluminium	2.43	179 11
Antimony 99·0	2.80	206 18
Cadmium	16.25	1,200 17
Copper: electrolytic	3.22	237 19
Lead	.93	68 14
Nickel	9.00	665 2
Tin	13.48	996 3
Zinc: Thermic	1.07	79 1
Zinc: electrolytic	1.15	85 0
Scrap		
Copper: electrolytic	2.85	210 12
Heavy copper	2.85	210 12
No. 1 copper wire	2.70	199 10
Brass rod ends	2.12	156 13
Zinc castings	.87	64 5
Lead	.87	64 5
Aluminium	1.80	133 0

Italy	lire/kg	£/ton
Aluminium	370	216 1
Antimony 99·0	485	283 4
Copper: wire bars 99·9	450	262 16
Lead	165	96 8
Nickel	1,300	805 14
Tin	1,820	1,062 17
Zinc: electrolytic	171	99 17
Scrap		
Aluminium soft sheet clippings (new)	300	175 4
Lead, soft, first quality	135	78 16
Lead, battery plates	75	43 16
Copper, first grade	365	213 3
Bronze, commercial gunmetal	420	245 7
Brass: heavy	270	157 13
Brass: light	255	148 18
Brass, bar turnings	265	154 15
Old zinc	98	57 4

Switzerland	fr/kg	£/ton
Aluminium	2.50	210 5
Copper: electrolytic	2.82	237 3
Lead	.80	67 5
Nickel	7.70	647 11
Tin	11.65	979 15
Zinc: High grade 99.99	.99	83 5

Japan	Yen per metric t
Scrap	
Copper: electrolytic	280,000
Copper wire No. 1	250 000
Copper wire No. 2	240,000
Heavy copper	234,000
Light copper	226,000
Brass, new cuttings	190,000
Red brass scrap	218,000

West Germany *Scrap*	D-marks per 100 kilos	£/ton
Used copper wire	220	200 8
Heavy copper	216	196 15
Light copper	190	173 1
Heavy brass	145	132 1
Light brass	110	100 5
Soft lead	50	45 11
Zinc	50	45 11
Used aluminium unsorted	90	82 0

United States	c/lb	£/ton
Aluminium	24.00	191 5
Antimony 99·0	32.50	259 0
Cadmium	160.00	1,275 4
Copper: electrolytic	31.00	247 10
Lead	11.00	87 13
Nickel	81.35	648 7
Tin	120.87	963 6
Zinc: electrolytic	12.50	99 12

THE STOCK EXCHANGE

Markets Failed To Establish Any Trend

ISSUED CAPITAL *	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 23 OCTOBER	+RISE—FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV. YEAR	DIV. YIELD	1961 HIGH	1961 LOW	1960 HIGH	1960 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation ...	28/6	—3d.	11	9	7 14 6	33/9	26/3	35/–	26/6
400,000	2/–	Anti-Attrition Metal	1/3		NIL	4	NIL	1/3½	0/9	1/6	0/9
43,133,663	Stk. (£1)	Associated Electrical Industries ...	30/3	+1/6	15	15	9 18 3	54/10½	28/3	67/3	38/3
3,895,963	1	Birfield	61/6	—6d.	10	15‡	3 5 0	78/9	45/–	51/3	29/–
4,795,000	1	Birmid Industries	69/–		20	20D	5 16 0	103/–	68/3	74/9	56/–
8,445,516	Stk. (10/–)	Birmingham Small Arms	19/3		17½QT	12½	6 2 3	36/10½	19/3	30/6	18/3
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	12/6		5	5	8 0 0	14/6	12/3	17/4½	14/9
476,420	Stk. (£1)	Ditto Cum. B. Pref. 6%	15/6		6	6	7 14 9	17/6	15/4½	20/–	17/1½
1,500,000	Stk. (£1)	British Aluminium Co. Pref. 6% ...	16/3		6	6	7 7 9	18/–	15/3	21/1½	17/7½
21,737,634	Stk. (£1)	British Insulated Callender's Cables	55/3	+9d.	13½	13½	4 17 9	62/3	49/–	61/4½	47/–
30,683,348	5/–	British Oxygen Co. Ltd., Ord. ...	15/6	+6d.	16D	16	3 8 9	28/4½	14/9	35/–	19/10½
1,200,000	Stk. (5/–)	Canning (W.) & Co.	14/3		15⅝	25+*2½C‡	5 1 6	20/9	13/7½	19/9	13/7½
60,484	1/–	Carr (Chas.)	1/–		NIL	12½	—	1/7½	10½d.	2/3	1/–
550,000	1	Clifford (Chas.) Ltd.	29/–		12	10	8 5 6	31/–	26/–	35/–	28/9
45,000	1	Ditto Cum. Pref. 6%	15/–		6	6	8 0 0	15/3	15/–	16/–	15/10½
1,166,000	Stk. (2/–)	Clifford Components V	8/–		25*2½C	25*2½C	6 5 0	10/1½	7/3	11/9	6/10½
300,000	2/–	Coley Metals	2/9	—3d.	15	15	10 18 3	4/5½	2/9	5/–	3/4½
10,185,696	1	Cons. Zinc Corp.†	59/3	—2/3	20	15	6 15 0	81/6	58/6	80/9	59/6
5,399,056	5/–	Davy-Ashmore	32/–	—2/3	27½	22½	4 6 0	44/6	32/–	147/3	99/6
8,995,011	5/–	Delta Metal	20/–xd		20	17½	5 0 0	27/7½	19/9	28/3	18/6
5,296,550	Stk. (£1)	Enfield Rolling Mills Ltd.	37/9	+6d.	15	15	7 19 0	52/3	36/6	56/9	45/–
1,155,000	1	Evered & Co.	42/9	—9d.	10	10φB	4 13 6	45/9	42/6	42/9	29/3
18,000,000	Stk. (£1)	General Electric Co.	25/3	+1/–	10	10	7 18 6	39/6	24/3	47/9	29/–
1,500,000	Stk. (10/–)	General Refractories Ltd.	49/6	—1/3	25	20	5 1 0	65/–	42/9	52/6	40/–
937,500	5/–	Glacier Metal Co. Ltd.	16/9	+6d.	15	13	4 9 6	21/1½	13/9	16/1½	11/1½
2,750,000	5/–	Glynwed Tubes	23/6		22½	25¶	4 15 9	30/3	23/–	27/6	17/–
7,228,065	10/–	Goodlass Wall & Lead Industries ...	28/6	+6d.	15	19L	5 5 3	44/9	28/–	41/9	33/–
696,780	10/–	Greenwood & Batley	14/6	—1/9	15	30‡	10 7 0	29/6	14/3	33/6	29/1½
792,000	5/–	Harrison (B'ham) Ord.	9/–		*10	*20‡	5 11 0	14/6	8/6	15/10½	11/9
150,000	1	Ditto Cum. Pref. 7%	18/–		7	7	7 15 6	20/4½	18/–	23/6	22/–
1,612,750	5/–	Heenan Group	13/3	—3d.	13	15	4 18 0	17/1½	10/6	13/–	9/10½
251,689,407	Stk. (£1)	Imperial Chemical Industries ...	59/9	+2/9	13½	11½	4 12 0	81/6	56/3	76/6	54/–
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	14/9		5	5	6 15 6	16/–	13/10½	18/–	15/4½
29,196,118	**	International Nickel	146½	+1½	$1.60	$1.50	1 17 0	160	104	105	84½
6,000,000	1	Johnson, Matthey & Co.	70/–	+9d.	15	12	4 5 9	75/–	57/6	67/6	44/9
600,000	10/–	Keith, Blackman	17/6		17½	17½E	10 0 0	21/6	16/6	32/6	17/6
320,000	4/–	London Aluminium	11/6		13	12	4 10 6	15/–	8/6	12/6	7/10½
1,530,024	1	McKechnie Bros. A Ord.	32/6		12½K	17½F	7 13 9	53/3	32/6	69/3	55/–
1,108,268	5/–	Manganese Bronze & Brass	11/–		20⅞	20⅞	9 9 3	18/6	10/9	18/6	13/4½
50,628	6/–	Ditto (7½% N.C. Pref.)	5/3		7½	7½	8 10 6	6/–	5/–	6/6	5/9
26,361,444	Stk. (£1)	Metal Box	76/6	—2/6	12	12M	3 2 9	100/9	68/3	84/3	61/–
415,760	Stk. (2/–)	Metal Traders	7/6		50	50	13 6 9	8/9	6/9	10/9	7/1½
240,000	1	Mint (The) Birmingham	33/9		15G	12½	5 18 3	35/9	24/–	39/–	33/6
80,000	5	Ditto Pref. 6%	71/6		6	6	8 7 9	77/6	71/6	80/–	75/–
274,152	1/–	Minworth Metals	5/3	—3d.	30	30S	5 14 3	6/3	4/6½	5/2½	3/10½
5,187,938	Stk. (£1)	Morgan Crucible A	58/9	—1/–	14	13	4 15 3	71/3	53/4½	63/–	47/6
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref. ...	14/6		5½	5½	7 11 9	17/–	13/10½	18/9	15/9
3,850,000	Stk. (£1)	Murex	37/6		13	22½J	6 18 9	52/–	36/9	45/–	35/3
585,000	5/–	Ratcliffs (Great Bridge) Ord. ...	15/6xd	—4½d.	10	10R	3 4 6	16/6	15/9	17/–	14/9
1,064,880	10/–	Sanderson Kayser	35/–		17½	35‡	5 0 0	41/3	29/–	40/3	27/7½
3,400,500	Stk. (5/–)	Serck	14/3	+3d.	12½	12½	4 7 9	19/3	13/9	25/6	15/3
212,384	5/–	Stedall & Co.	7/9		15	15	9 13 6	10/3	7/6	10/3	6/3
8,035,372	Stk. (£1)	Stone-Platt Industries	48/–	—9d.	16	15	6 13 3	67/–	48/–	64/4½	52/3
2,928,963	Stk. (£1)	Ditto 5½% Cum. Pref.	15/–	+6d.	5½	5½	7 6 9	18/–	13/6	18/7½	15/3
35,344,881	Stk. (£1)	Tube Investments Ord.	57/6	+2/–	14	20	4 17 6	85/6	54/–	140/3	63/10½
41,000,000	Stk. (£1)	Vickers	26/6		10	10	7 11 0	38/3	26/3	39/7½	27/1½
750,000	Stk. (£1)	Ditto Pref. 5%	13/–		5	5	7 13 9	15/–	12/4½	17/6	13/3
6,863,807	Stk. (£1)	Ditto Pref. 5% tax free	18/6		*5	*5	8 3 6A	21/1½	18/–	24/6	20/1½
4,594,418	1	Ward (Thos. W.) Ord.	67/9	—1/–	13⅔	13⅔	4 1 0	84/6	64/6	94/–	63/–
7,109,424	Stk. (£1)	Westinghouse Brake	25/6		11	10	8 12 6	46/3	25/–	60/6	37/6
323,773	2/–	Wolverhampton Die-Casting ...	8/–		35	30	8 15 0	13/4½	7/10½	13/10½	8/1½
591,000	5/–	Wolverhampton Metal	21/–	—6d.	32½	32½	7 14 9	30/–	20/–	39/9	23/9
156,930	2/6	Wright, Bindley & Gell	4/3		15	20‡	8 16 6	4/9	3/7½	4/6	2/10½
124,140	1	Ditto Cum. Pref. 6%	12/9		6	6	9 8 3	13/7½	12/9	15/–	13/6
150,000	1/–	Zinc Alloy Rust Proof	4/3		40	30	9 8 3	5/6	4/3	5/4½	4/–

*Dividend paid free of Income Tax. †Incorporating Zinc Corpn. & Imperial Smelting. **Shares of no Par Value. ‡and 100% capitalized issue. ● The figures given relate to the issue quoted in the third column. A Calculated on £7 8 9 gross. D and 50% capitalized issue. C paid out of Capital Profits. E and 50% capitalized issue in 7% 2nd Pref. Shares. R and 33⅓% capitalized issue in 8% Maximum Ordinary 5/– Stock Units. φ and 6⅔% from Capital Profits. B and 50% capitalized issue. G and 50% capitalized issue. F and special 5% tax free dividend and 50% capitalized issue. ¶and 3 for 7 capitalized issue. L and 33⅓% capitalized issue. M and 10% capitalized issue. J and 75% capitalized issue. Q also 1/– special tax free dividend and 50% capitalized issue. T Per £1 unit. K Forecast dividend. S and 50% capitalized issue. V incorporating Clifford Covering.

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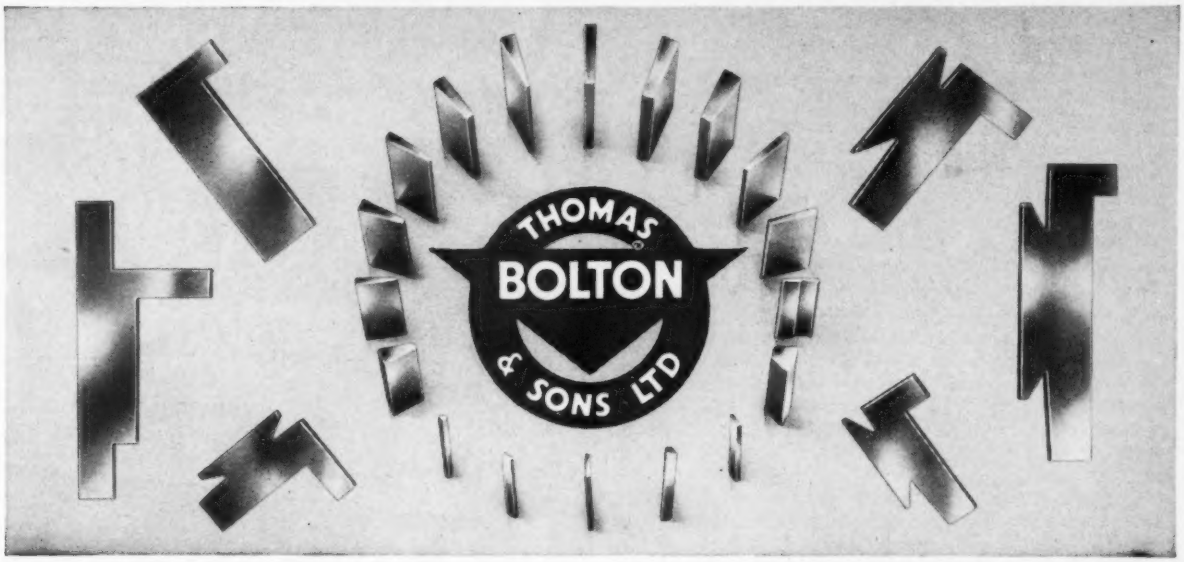

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COMPANY MEETING

CAPPER PASS & SON LIMITED

A VERY SATISFACTORY RESULT

The 50th annual ordinary general meeting of Capper Pass & Son Limited was held on October 19 in Bristol, The Lord Fraser of Lonsdale, C.H., C.B.E., the chairman, presiding.

The following is an extract from his circulated statement:

Your Company has had a better year than the previous year and has made more money. We are recommending the same dividend, namely a total of 10%. Considering the fact that salaries, wages and indeed all costs of operation have risen steadily, this is a very satisfactory result.

As a Custom Smelter we receive metalliferous materials from various parts of the world and convert these materials into saleable metal. In this sense, we perform a service for which we are remunerated in the form of treatment charges, which represent the difference between the saleable value of the metal and the lesser sum we pay for the raw material. From these treatment charges, we have to meet our working costs. The balance is our working or smelting profit.

Our own calculation is that, for the year to March 31st, 1961, we made a smelting profit of £334,000 as compared with £287,000 for the previous year.

The Accounts show that the audited profit—or the official profit upon which we pay tax—is less than last year (1960-61 £356,035: 1959-60 £415,086), but this is accounted for by the fact that it is our long-standing custom to bear ourselves the ups and downs in the world prices of metals, instead of "hedging" them on the London Market. In the previous year (1959-60) we made a profit on metal prices and carried a substantial sum (£50,000) to our market reserve, whereas in the year under review (1960-61) we made a loss on metal prices and therefore withdrew £12,000 (net after tax) from the market reserve.

As regards our Smelting Profit, half the current year having gone, I make a cautious estimate that, subject to political and commercial risks, the results of the current year's working will turn out satisfactory.

EXTENSIVE MODERNISATION PROGRAMME

The problem of reducing costs has caused us to plan for a very extensive modernization and stream-lining of our plant. The planning stage is now nearing completion and we mean to embark on this scheme with a view to completing it within two or three years. This modernisation has largely been made practicable by the encouraging results shown by the new type of furnace to which I referred in my last statement, and which has now completed a year's successful trial. Although it will require a big effort on the part of our management to put these plans into effect, I am hopeful they will do so successfully and that it will make an improvement to our profits in a few years' time.

The extension of our plant for copper production which I told you last year was being planned has now come into use and helps us to treat a wider range of materials.

We welcome the Government's more definite approach to the Common Market. Britain's entry will not present your Company with disadvantages because we are international traders operating in free competition without subsidy or protection; on the contrary we think the inclusion of Britain in a European Common Market will help your company.

The Report was adopted.

CONRAD M. CARLSRUD

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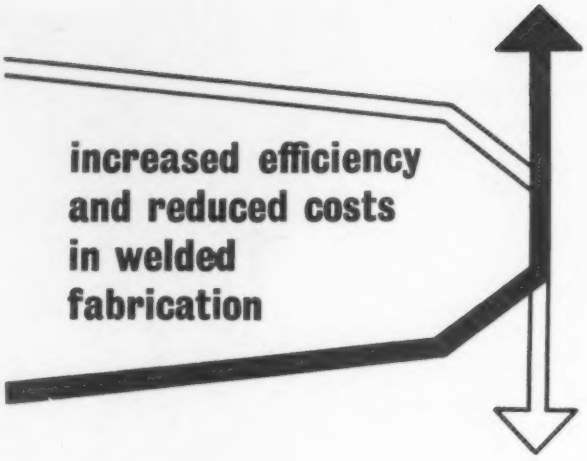

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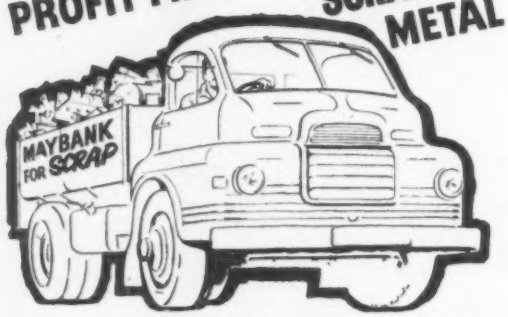

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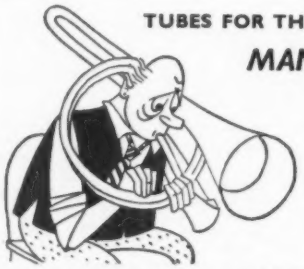

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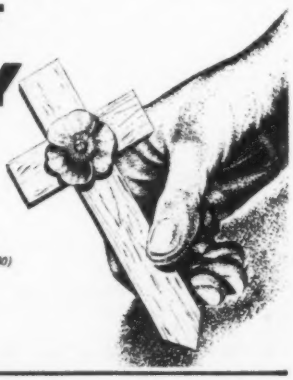

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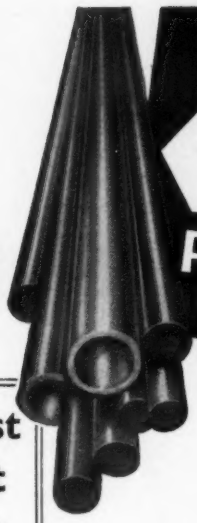

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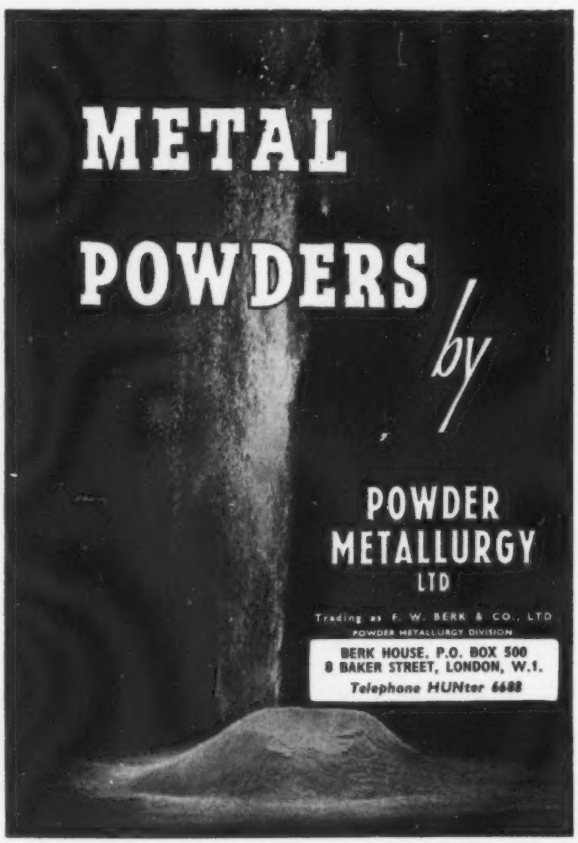

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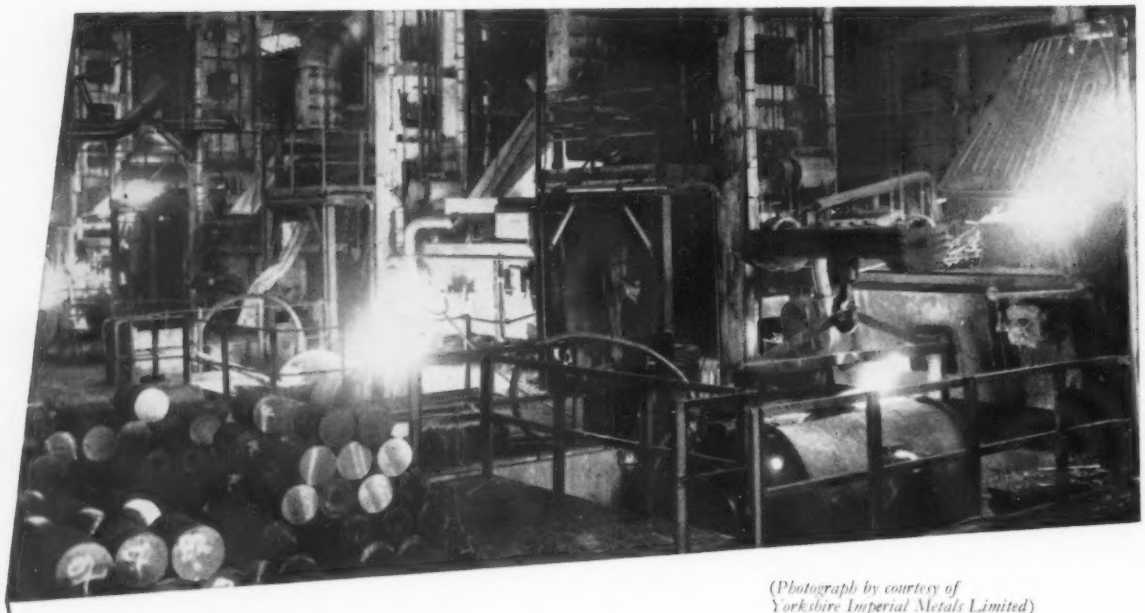

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